BLAUPUNKT
Bosch Telecom

V19668

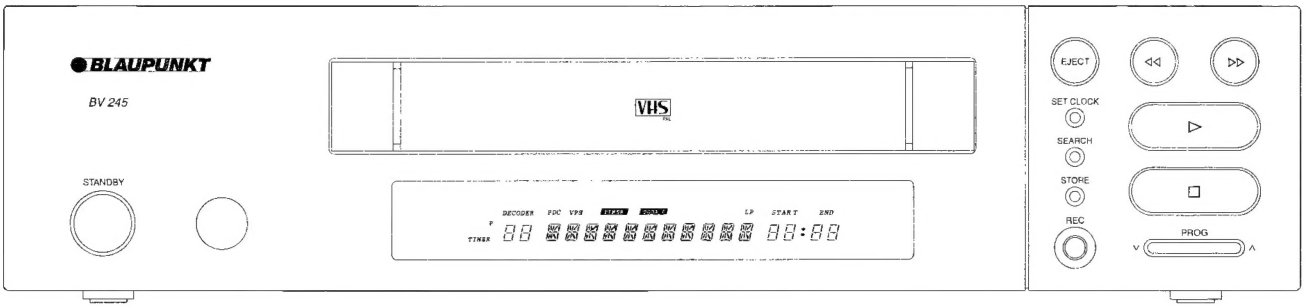
Video Recorder

BV-245 EGC	7 618 361
BV-245 EC	7 618 371
BV-245 OIRT	7 618 381
BV-445 OIRT	7 618 374
RTV-205 PSW	7 618 391

Service Manual

Supplementary documentation
Spare Parts List (K7/VKD 1 D 95 300 006)

K7/VKD 1 D95 400 013



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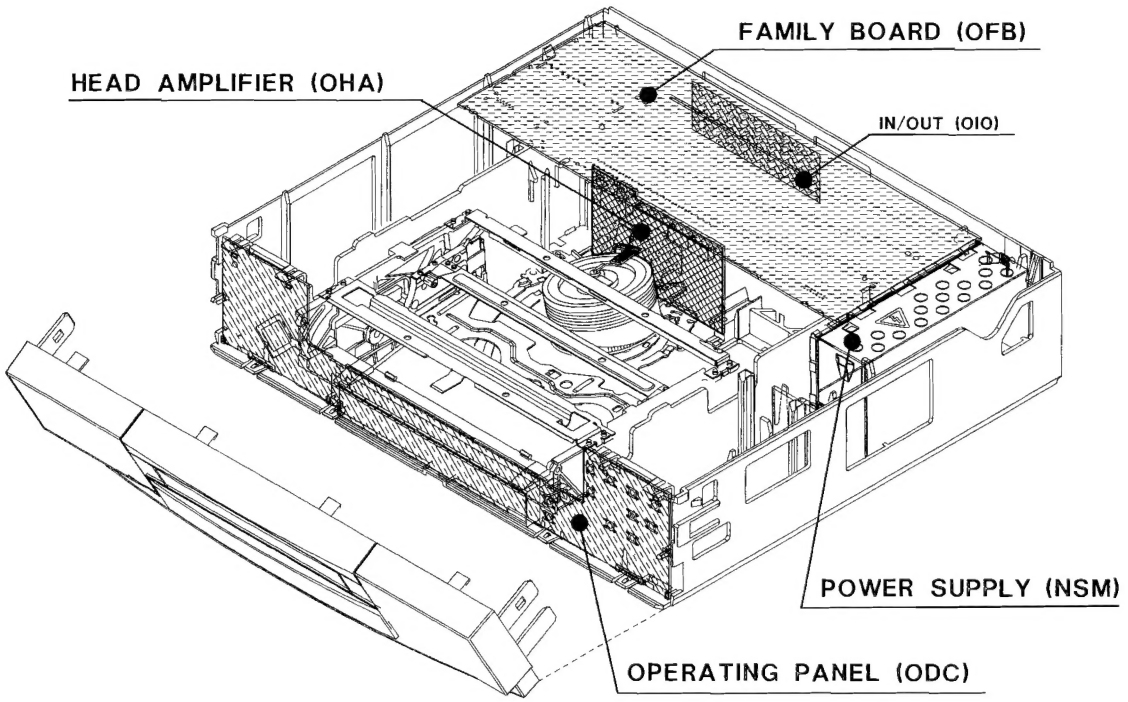
FEATURES

	PAL B/G	PAL I FOR IRELAND	PAL I FOR UK	PAL B/G - SECAM B/G, D/K	PAL B/G - SECAM L/L', B/G	2 VIDEO HEADS	4 VIDEO HEADS	LCD REMOTE CONTROL	VPS	TRANS. IDENTIF. VIA VPS/PDC	VIDEO LONG PLAY	FRAME ADVANCE	SLOW MOTION	SUPER SLOW MOTION	DOUBLE FINE SLOW	FIELD ADVANCE	NTSC PLAYBACK	2 SCART CONNECTORS	6 SEC. BACK UP OF CLOCK & CAL. EVENTS	PRESETS NUMBER 42	NUMBER OF EVENTS 4	HYPERBAND/CABLE TUNER
BV-245 EC	•					•						•							•	•	•	•
BV-245 EGC	•					•			•			•							•	•	•	•
BV-245 OIRT				•		•			•			•					•		•	•	•	•
BV-445 OIRT				•			•		•		•	•	•	•	•	•	•		•	•	•	•
RTV-205 PSW					•	•						•						•	•	•	•	•

Survey of sets and PCB's

	FAMILY BOARD	-VS Video signal processing	-IO Input/Output	-FV Frontend	-AL Audio linear	-DE Deck electronics		IN/OUT BOARD	OPERATING PANEL	HEAD AMPLIFIER			POWER SUPPLY	TAPE DECK			
	OFB11/ILP	OFB11/2G	OFB11/2GV	OFB12G/2GL	OFB11/2GKV	OFB11/IILP	OFB11/4GKV	OIO/S	ODCL2/ECO	OHA2/0	OHA2/0LP	OHA4/0	NSM1	WD-D-P2/0	WD-D-P2/OLP	WD-D-S4/0	WD-D-P4/0
Seite 3 -	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**16**	**18**	**6**	**6**	**6**	**4**	**CHAPTER 4**			
BV-245 EC		●							●	●			●	●			
BV-245 EPC			●						●	●			●	●			
BV-245 OIRT					●				●	●			●	●			
BV-445 OIRT							●		●			●	●			●	
RTV-205 PSW				●					●	●			●	●			



Remarks:

Safety instructions

- Safety regulations demand that the set be restored to its original condition and that components identical with the original types be used.

  Safety components are marked by the symbol ⚠

- All ICs and many other semi-conductors are susceptible to electrostatic discharges (ESD). Careless handling during repair may reduce life drastically. When repairing, make sure that you are conneted with the same potential as the mass of the set via a wrist wrap with resistance. Keep components and tools on the same potential.
- A set to be repaired should always be connected to the mains via a suitable isolating transformer.
- Never replace any modules or any other parts while the set is switched on.
- Use plastic instead of metal alignment tools. This in order to prelude short-circuit or to prevent a specific circuit from being rendered unstable.

Remarks

- The direct voltages and oscillograms ought to be measured relative to the set mass.
  EXCEPTION
  At the power supply, the DC voltages and the oscillograms at the primary side are measured to LIVE GND.
- The direct voltages and oscillograms mentioned in the diagrams ought to be measured with a colour bar signal and the picture carrier at 503.25 MHz (C25).
- The oscillograms and direct voltages have been measured in RECORD or PLAY mode.
- The semiconductors, which are mentioned in the circuit diagram and in the parts lists, are fully exchangeable per position with the semiconductors in the set, irrespective of the type designation of these semiconductors.

Sicherheitshinweise

- Die Sicherheitsvorschriften erfordern es, daß sich das Gerät nach der Reparatur in seinem originalen Zustand befindet und daß die zur Reparatur benutzten Ersatzteile mit den Originalersatzteilen identisch sind.

  Sicherheits-Bauteile sind mit der Markierung ⚠ versehen

- Alle IC's und Halbleiter sind empfindlich gegen elektrostatische Entladungen (ESD). Unvorschriftmässige Behandlung von Halbleitern im Reparaturfall kann zur Zerstörung dieser Bauteile oder zu einer drastischen Reduzierung der Lebensdauer führen. Sorgen Sie dafür, daß Sie sich im Reparaturfall über ein Armband mit Widerstand auf dem gleichen Potential, wie die Masse des Gerätes befinden. Alle Bauteile, Werkzeuge und Hilfsmittel sind auf das gleiche Potential zu legen.
- Ein zu reparierendes Gerät ist immer über einen Trenntransformator an die Netzspannung anzuschließen.
- Bei eingeschaltetem Gerät dürfen keine Module oder sonstige Einzelteile ausgetauscht werden.
- Zum Abgleich sind ausschließlich Kunststoffwerkzeuge zu benutzen (keine Metallwerkzeuge verwenden). Dadurch wird vermieden, daß ein Kurzschluß entstehen kann oder eine Schaltung instabil wird.

Anmerkungen

- Die Gleichspannung und Oszillogramme sind gegen Gerätemasse zu messen.
  AUSNAHME
  Beim Netzteil sind die Gleichspannungen und Oszillogramme auf der Primärseite gegen Live GND gemessen.
- Die Gleichspannungen und Oszillogramme angeführt in den Schaltbildern sollen unter folgenden Bedingungen gemessen werden: Farbbalkensignal, Bildträger auf 503.25 MHz (C25)
- Die Oszillogramme und Gleichspannungen sind in RECORD oder PLAY gemessen. Die in den Stücklisten aufgeführten Bauteile sind positionsweise voll auswechselbar gegen die Bauteile in dem Gerät, ungeachtet der etwaigen Typenbezeichnungen.

Avertissements

- Les normes de sécurité exigent qu'aprés réparation l'appareil soit remis dans son état d'origine et que soient utilisées les piéces de rechange identiques à celles spécifiées.

  Les composants de sécurité sont marqués ⚠

- Tout les IC et beaucoup d'autres semi-conducteurs sont sensibles aux décharger statiques (ESD). Leur longévité pourrait étre considérablement écourté par le fait qu'aucune précaution n'est prise à leur manipulation. Lors de réparations s'assurer de bien étre relié au méme potential que la masse de l'appareil et enfiler le bracelet serti d'une résistance de sécurité. Veiller à ce que les composants ainsi que les outils que l'on utilise soient également à ce potentiel.
- Toujours alimenter un appareil à réparer à travers un transfo d'isolement.
- Ne jamais remplacer les modules ni d'autres composants quand l'appareil est sous tension.
- Pour l'ajustage, utiliser des outils en plastique au lieu d'instruments métalliques. Ceci afin d'éviter les court-circuits et exclure l'instabilité dans certains circuits.

Observations

- La mésure des tensions continues et des oscillogrammes doit se faire par rapport à la terre de l'appareil.
  EXCEPTION
  Sur l'unité d'alimentation la tension continue et l'oscillogramme sont mesurés sur le côte primaire en Live GND.
- La mésure des tensions continues et des oscillogrammes figurant sur le schéma doit se faire dans un signal de barre couleur porteuse image sur 503.25 MHz (C25).
- Les oscillogrammes et tension sont mésurées en mode RECORD ou PLAY.
- Les semi-conducteurs indiqués dans le schéma de principe et à la liste des compostants, sont interchangeables par repère sur ce chassis avec les semi-conducteurs de l'appareil quelle que soit la désignation de type donnée sur ces semi-conducteurs.

Veiligheidsinstructies

- Veiligheidsbepalingen vereisen, dat het apparaat in zijn oorspronkelijke toestand wordt teruggebracht en dat onderdelen, indentiek aan de oorspronkelijke, worden toegepast.

  De veiligheidsonderdelen zijn aangeduid met het symbool ⚠

- Alle IC's en vele andere halfgeleiders zijn gevoelig voor elektrostatische ontladingen (ESD). Onzorgvuldig behandelen tijdens reparatie kan de levensduur drastisch doen verminderen. Zorg ervoor, dat U tijdens reparatie via een polsband met weerstand verbonden bent met hetzelfde potentiaal als de massa van het apparaat. Houd componenten en hulpmiddelen ook op ditzelfde potentiaal.
- Sluit een apparaat dat gerepareerd wordt altijd via een scheidingstransformator aan op de netspanning.
- Verwissel nooit modules of andere onderdelen terwijl het apparaat is ingeschakeld.
- Gebruik voor het afregelen plastic i.p.v metalen gereedschap. Dit om mogelijke kortsluiting te voorkomen of een bepaalde schakeling instabiel te maken.

Opmerkingen

- De gelijksspanningen en oscillogrammen dienen gemeten te worden ten opzichte van de apparaat aarde.
- De gelijksspanningen en oscillogrammen vermeld in de schema's dienen gemeten te worden met een kleurbalkensignaal beelddraaggolf op 503.25 MHz (C25).
- De oscillogrammen en gelijksspanningen zijn in RECORD of PLAY mode gemeten.
- De halfgeleiders, die in het pricipeschema en in de stuklijsten, zijn vermeld, zijn per positie volledig uitwisselbaar met de halfgeleiders in het apparaat, ongeacht de typeaanduiding op deze halfgeleiders.

Avvertimenti

– Le prescrizioni di sicurezza richiedono che l'apparecchio sia ricondotto alle condizioni originali e che siano usati ricambi originali.

Componenti di sicurezza sono marcati con ⚠

– Tutti gli IC e semiconduttori sono sensibili a scariche elettrostatiche (ESD). Noncuranze durante la riparazione di semiconduttori possono danneggiarli o condurre ad una riduzione drastica della durata. Durante la riparazione assicurarsi di essere collegati allo stesso potenziale attraverso un bracciale di protezione contro scariche elettrostatiche. Inoltre tenere anche tutti i componenti e gli attrezzi a questo potenziale.
– Apparecchi da riparare bisogna collegarli sempre via un trasformatore isolante (separatore) alla tensione normale.
– Non scambiare moduli o altri componenti quando l'apparecchio è in funzione.
– Per l'accordo usare soltanto attrezzi di plastica (non usare attrezzi metallici). Cosí si evitano cortocircuiti e collegamenti instabili.

Osservazioni

– Misurare le tensioni continue e gli oscillogrammi riferiendosi alla massa dell'apparecchio.
ECCEZIONE
Le tensioni continue e gli oscillogrammi dall'alimentatore sono misurati sulla parte primaria contro GND-Live.
– Le tensioni continue e gli oscillogrammi indicati negli schemi di collegamento devono essere misurati secondo le condizioni seguenti: segnale barre colore, portante dell'immagine su: 503.25 MHz (C25).
– Gli oscillogrammi e le tensioni continue sono misurati in RECORD o PLAYBACK.
– I componenti indicati nelle liste sono intercambiabili con quelli nell'apparecchio nonostante l'eventuale denominazione di modelli.

Avisos

– Las instrucciones de seguridad exigen que después de la reparación el aparato se encuentre en el estadooriginal y que las piezas de repuesto, utilizadas para la reparación, sean idénticas a las originales.

Los componentes de seguridad estan marcados con ⚠

– Todos los IC y semiconductores son sensibles a descargas electrostáticas (ESD). Un tratamiento no conforme a las instrucciones de semiconductores en caso de reparación, podría llevar a la destrucción de estos componentes, o a una reducción drástica de la duración. Tenga cuidado de que, en caso de reparación, estar al mismo potencial que la masa del aparato, por una pulsera con resistencia. Ponga todos los componentes, herramientas y recursos al mismo potencial.
– Para reparar un aparato hay que conectarlo siempre a la alimentación a traves de un transformador de aislamiento.
– Cuando un aparato está en marcha no pueden ser cambiados módulos u otras piezas de repuesto.
– Para los ajustes hay que utilizar exclusivamente herramientas de plástico (nunca herramientas metálicas). Así se evitaran cortocircuitos y circuitos inestables.

Notas

– Hay que medir las tensiones continuas y los oscilogramas contra la masa del aparato.
EXCEPCION:
Las tensiones continuas y los oscilogramas de la fuente de alimentación son medidos en la primaria contra GND-Live.
– Las tensiones continuas y los oscilogramas mencionados en los esquemas tienen que ser medidos de manera siguiente: señal barra de color portadora de imagen en 503.25MHz (C25)
– Los oscilogramas y las tensiones continuas son medidas en „RECORD" y „PLAYBACK"
– Los componentes mencionados en las listas se los puede cambiar por los componentes en el aparato, a pesar de eventuales designaciones de tipos.

(GB)

TECHNICAL DATA

Mains voltage	220 - 240 V
Mains frequency	45 - 65 Hz
Power consumption	12,5 W
Ambient temperature	+10°C to +35°C
Relative humidity	20 - 80 %
Dimensions	380 x 86 x 339 mm
Weight	~4,6 kg
Fast forward/rewind time	typ. 260s (E180 cass.)
Position of use	horizontally, max. 15°
Video resolution	>234 lines
Audio	
Audio SP:	80Hz - 10kHz (≤8dB)
Audio LP:	80Hz - 5kHz (≤8dB)

(D)

TECHNISCHE DATEN

Netzspannung	
Netzfrequenz	
Leistungsaufnahme	
Raumtemperatur	
Relative Luftfeuchtigkeit	
Abmessungen	
Gewicht	
Vor-/Rückspulzeit	
Betriebslage	
Video-Auflösung	
Audio	

(F)

CARACTERISTIQUES

Tension secteur	220 - 240 V
Fréquence	45 - 65 Hz
Puissance absorbée	12,5 W
Température ambiante	+10°C to +35°C
Humidité relative	20 - 80 %
Encombrement	380 x 86 x 339 mm
Poids	~4,6 kg
Temps (re-)bobinage	typ. 260s (E180 cass.)
Position d'emploi	horizontally, max. 15°
Puissance absorbée	>234 lines
Audio SP:	80Hz - 10kHz (≤8dB)
Audio LP:	80Hz - 5kHz (≤8dB)

(NL)

TECHNISCHE GEGEVENS

Netspanning	220 - 240 V
Netfrequentie	45 - 65 Hz
Opgenomen vermogen	12,5 W
Omgevingstemperatuur	+10°C to +35°C
Relatieve vochtigheid	20 - 80 %
Afmetingen	380 x 86 x 339 mm
Gewicht	~4,6 kg
Vooruit/terugspoeltijd	typ. 260s (E180 cass.)
Gebruikspositie	horizontally, max. 15°
Opplossend vermogen	>234 lines
Audio	
Audio SP:	80Hz - 10kHz (≤8dB)
Audio LP:	80Hz - 5kHz (≤8dB)

(E)

DATOS TECNICOS

Tensión de red	
Frecuencia de red	
Consumo de potencia	
Temperatura ambiente	
Humedad relativa	
Dimensiones	
Peso	
tiempo de (re-)bobinado	
Posición de uso	
Resolución video	
Audio	

(I)

DATI TECNICI

Tensione di alimentazione	220 - 240 V
Frequenza di rete	45 - 65 Hz
Potenza assorbita	12,5 W
Temperatura ambiente	+10°C to +35°C
Umiditá relativa	20 - 80 %
Dimensioni	380 x 86 x 339 mm
Peso	~4,6 kg
Tempo di (ri-)avvolgimento	typ. 260s (E180 cass.)
Posizione di funzionamento	horizontally, max. 15°
Risoluzione video	>234 lines
Audio SP:	80Hz - 10kHz (≤8dB)
Audio LP:	80Hz - 5kHz (≤8dB)

Front of video recorder

STANDBY Standby switch

EJECT. Cassette eject

◀◀ Rewind/Reverse scanning

▶▶ Forward wind/Forward scanning

SET CLOCK Set clock

SEARCH Channel search

STORE Store TV channel

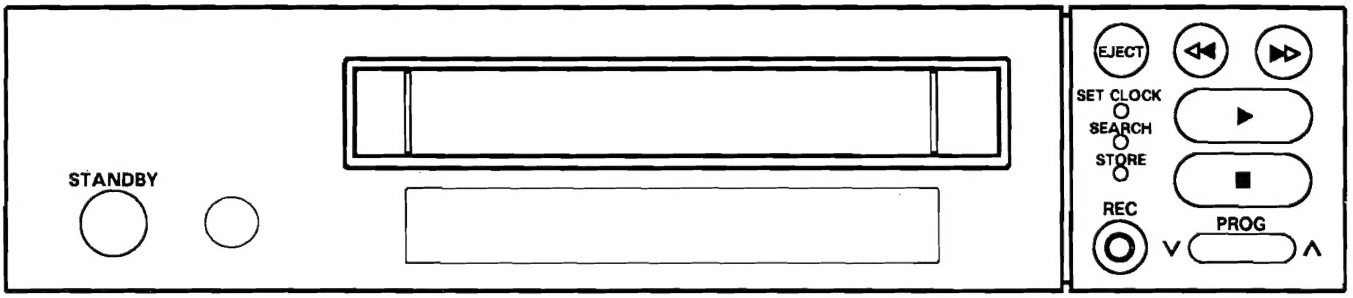
▶ Playback

■ Pause/Stop

REC. Record

∨ Down/Minus, programme number

∧ Up/Plus, programme number



Back of video recorder

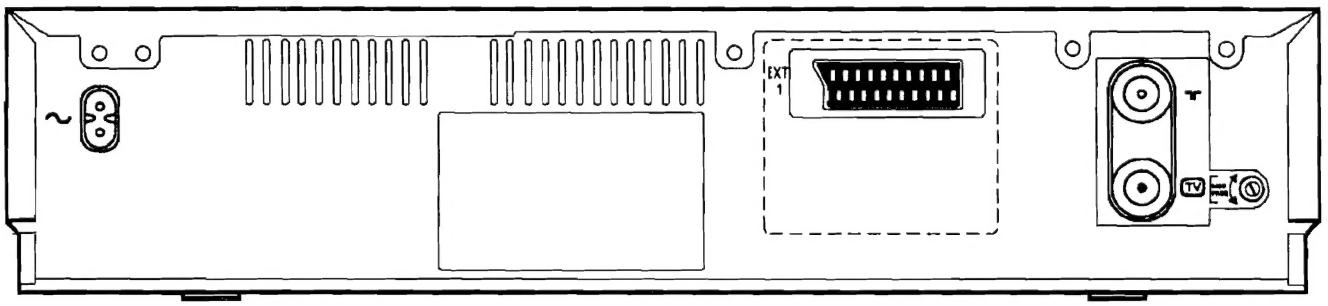
Aerial input socket

Aerial output socket

Mains socket

EXT 1 Scart (AV-Euro) socket

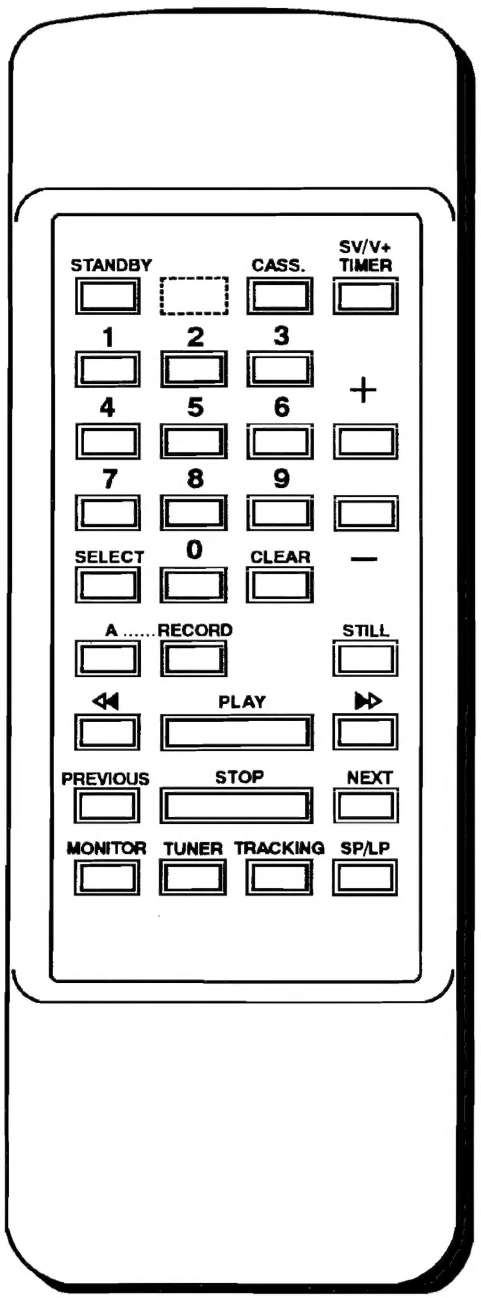
MOD. FREQ. Channel control



1. SUMMARY OF BUTTONS AND CONTROLS

Here is a list of the buttons, controls and sockets that you will use on the set and the remote control.
You will find detailed descriptions of the various functions in the relevant chapters.

The remote control



STANDBY Standby switch
SV / V+ TIMER TIMER programming on the video recorder
0-9 Digit buttons 0-9
SELECT Function selector
CLEAR Reset/clear
+ Up/Plus, programme number
− Down/Minus, programme number
A Activate record button
RECORD Record (A and RECORD buttons simultaneously)
STILL Still picture
◀◀ Rewind/Reverse scanning
PLAY Playback
▶▶ Wind/Forward scanning
STOP Stop
MONITOR TV monitor function
TUNER Tuner mode
TRACKING Tracking

Buttons that are not described in the list have **no** function.

FAULT LOCATING HELP FUNCTIONS

2. Service test program

2.1 Introduction

A service test program has been integrated in the software program of the operating and deck microprocessors. The service test program consists of the following functions:

-Display of mask numbers and operating and deck software versions

-Control of drive sensors

-Control of drive functions

-Operating hours counter

-Recorder initialization (Option Code)

-Endurance test

2.2 Activating the service test program

Press STOP button on remote control and keep pressed. Then press PLAY button on recorder and hold down for at least 5 sec. Whilst pressing the PLAY button on the recorder, the STOP button on the remote control can be released.
The display shows information similar to paragraph 2.3 (Fig. 1).
The next service step is selected with the OK, SELECT, or VPS button (depending on the remote control).
The service test program can be activated in any recorder operating state with the exception of the station search, install, timer adjustment and tape length selection modes. During the service mode the recorder is fully operational in all drive functions. To quit the service test program press the STAND BY button or disconnect recorder from mains.

2.3 Display information

(µP's and mask numbers)

Alphanumerical display: *

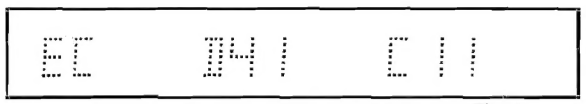


Fig. 1a

Numerical display: *

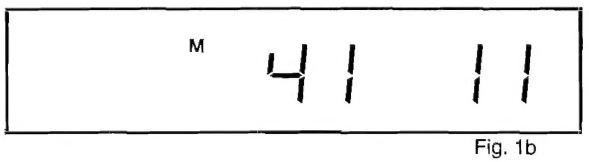


Fig. 1b

* Display can differ from one model to another.

The two first digits show:
(for alphanumeric display only)

Version	
EC	ECO
PH	Philips
BR	Brands/OEM

The next digits show the deck mask assignment and the mask number.

Deck mask	Version
ECO Mono	D4x
ECO Stereo	D5x
Standard without Swing Search	D3x
Standard with Swing Search	D6x

(Display : D = Deck mask for alphanumeric display only
41 = ECO MONO mask 1)

The last two digits show the operating mask assignment and mask number

Control mask	Version
ECO Mono	C1x
ECO Stereo	C2x
ECO /05 Autoinstall	C3x
PH Standard without PDC	C1x
PH Standard with PDC	C2x
BR Standard without PDC	C1x
BR Standard with PDC	C2x

(Display : C = Control mask for alphanumeric display only
11 = ECO-Mono mask 1)

2.4 Drive sensor control

The next service step is selected with the OK, SELECT, or VPS button (depending on the remote control).
The drive sensor control display contains four digits. One digital position shows several sensors. For each operated sensor the display value changes.

Fig. 2a

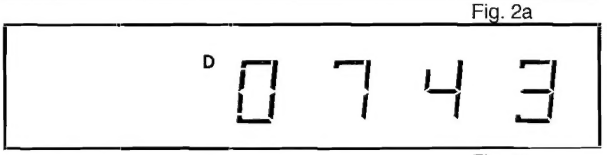


Fig. 2b

The first two digits show the drive position,
(e.g.: 07 = Eject)

Status	Position (FTA dec)	Display (hex)
Eject	7 +2/-2	07 +2/-2
Index/wind/rewind	94 +0/-2	5E +0/-2
Stop out	100 +3/-0	64 +3/-0
Play	214 +2/-2	D6 +2/-2
Reverse	237 +2/-0	ED +2/-0

The last two digits show the drive sensors:

Bit	Sensor	Bit	Sensor
0	tape end	4	tacho left (not for ECO)
1	tape begin	5	init switch
2	record protection	6	threading tacho
3	tacho right	7	not used (0)

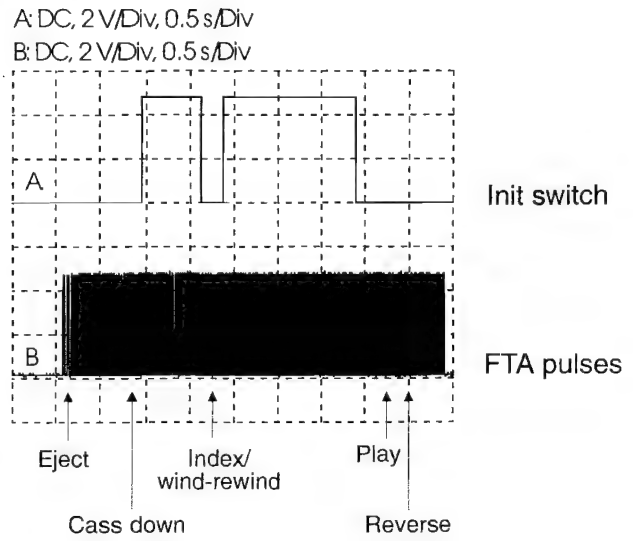
The display output of the bits is hexadecimal in two bytes, of which bit 7 is not assigned (0).
(0, 1, 2, 3,4, 5, 6, 7, 8, 9, A, B, C, D, E, F).

Example (Eject):
(X = depending on tacho position 1 or 0)

Bit	7	6	5	4	3	2	1	0
Value	0	X	0	0	X	0	1	1
Display		4	or	0		B	or	3

Functioning of Init switch:

The diagram shows the functioning of the init switch, depending on the drive position. The number of FTA pulses is important for the drive position.



2.5 Control of drive functions

2.5.1 Threading and unthreading time
The signal of the photoelectric barrier controlling the revolutions of the threading motor is used as reference for the threading and unthreading time.

2.5.2 Stopping of left or right winding disk
The tacho signals of the left (WTL) and right (WTR) winding disks are used as control reference.

2.5.3 Stopping of axial head motor
This is monitored with the PG/FG signal. The signal is discharged from the e.m.f. of the non-conducting spools of the axial head motor, showing the position of the head cylinder.

2.5.4 Capstan motor fault
This is monitored with the FGD signal.

If one of the above sensor signals is not available the recorder tries to put the lift in the "EJECT" position.

2.6 Explanation of deck fault codes and deck fault status

The last occurred fault code is stored and remains in the EEPROM even if the recorder is disconnected from the mains.
The fault code can be erased by pushing the CLEAR button on the remote control during the service mode.

2.7 Drive condition

The next service step is selected with the OK, SELECT, or VPS button (depending on the remote control).
The FTA signal arriving from the photoelectric barrier controlling the threading motor revolution is used to monitor the drive condition.

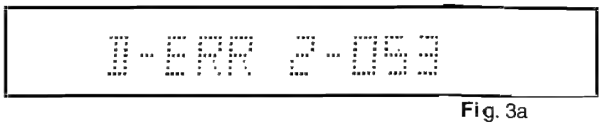


Fig. 3a

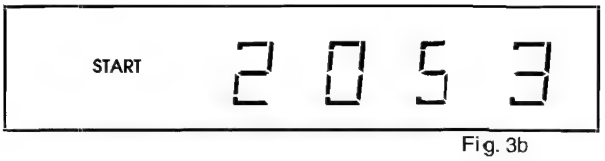


Fig. 3b

The first digit is the deck fault code:
(e.g.: 2 = Capstan fault)
The fault code can be reset with the CLEAR command.

0	no error
1	threading error
2	no capstan pulses
3	tape broken
4	no pulses left reel (not for ECO)
5	no pulses right reel
6	head motor error

The last three digits show the deck fault condition:
(e.g.: 053 = during Play)

012	Standby	046	Scan forward	215	Slow 7
045	Eject on	044	Scan reverse	212	Slow 10
054	Stop	052	Wind	211	Slow 14
041	Still	050	Rewind	196	Tuner eject
053	Play	048	Pause	197	Standby eject
125	Tuner	047	Reverse	112	Index next
055	Record	042	Fast forward	113	Index previous
014	Play+ Tracking	031	Fast reverse		

2.8 Operating hours counter

The next service step is selected with the OK, SELECT, or VPS button.
The step shows how many hours the head disc has rotated.
The display contains four digits.

e.g.: 1234 operating hours

Fig. 4a

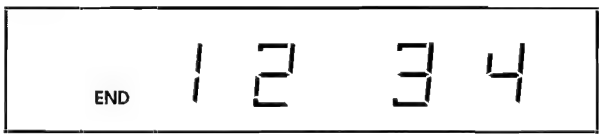


Fig. 4b

2.9 EEPROM

2.9.1 Erasing the EEPROM

- Disconnect from mains

-Keep WIND and REWIND buttons pressed and reconnect to mains.

All data is then erased from the EEPROM and initialized (Timer and Options). Also the internal processor RAM is erased.

2.9.2 Initialization of EEPROM

If a new EEPROM is installed as part of repair work, it must be newly initialized.

Step 1:
Activating the service test program.
Press STOP button on remote control and keep pressed. Then press PLAY button on recorder and keep pressed for at least 5 sec. Whilst pressing the PLAY button on the recorder, the STOP button on the remote control can be released.

Display shows for instance:

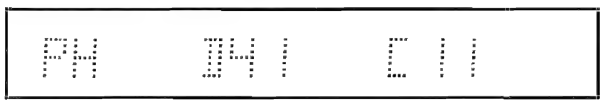


Fig. 5a

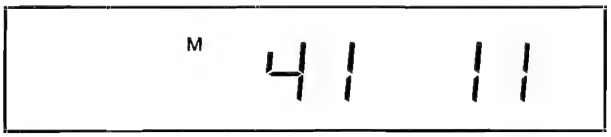


Fig. 5b

Step 2:
Activating the option code input.
Press STOP button on remote control and keep pressed. Then press PLAY button on recorder and keep pressed for at least 5 sec. Whilst pressing the PLAY button on the recorder, the STOP button on the remote control can be released.

By inputting a three digit decimal code (see code table) the correct features are set. The input can be erased by pressing the CLEAR button on the remote control.
The display shows the following information :

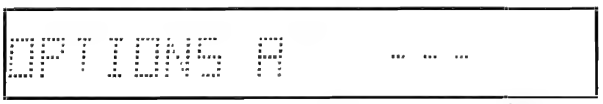


Fig. 6a

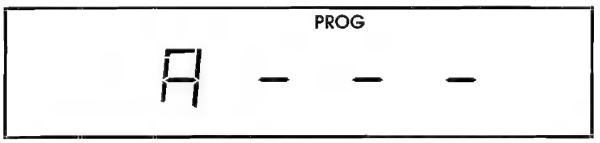


Fig. 6b

Step 3:
The next input step is selected with the OK, PROGRAM PRESET or STORE button (depending on the remote control).

To check the input code, it is shown in hexadecimal form on the display for approx. 2 sec. (see code table) before the next step is activated. The activation is only possible in ascending order, a return to a previous step is not possible. An incorrect code input requires a restart from option A.

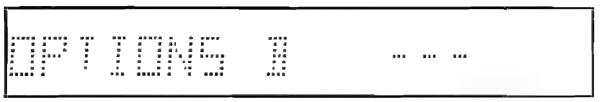


Fig. 7a

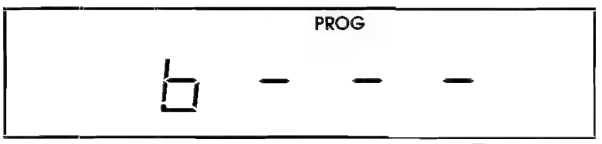


Fig. 7a

Step 4: (as step 3)

Fig. 8a

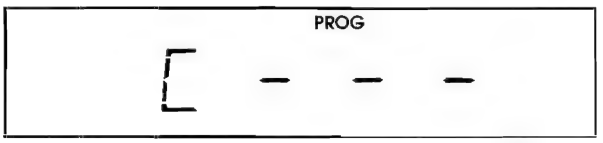


Fig. 8b

Step 5: (as step 3)

Fig. 9a

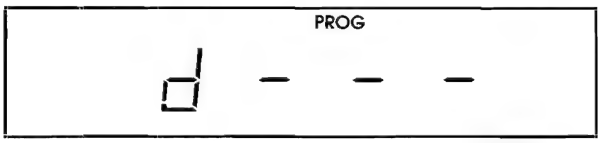


Fig. 9b

Step 6: (as step 3)

Fig. 10a

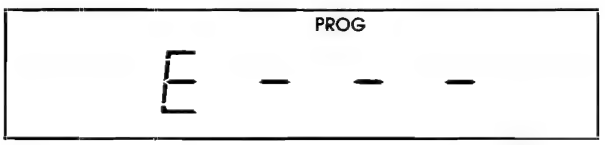


Fig. 10b

Step 7: (as step 3)
After the last input (E) the mask information appears again on the display (Fig. 5).
Check the inserted code:
Begin with step2 and press STORE. The display show for approx. 2sec. the optioncode A in hex (see code table); press STORE again, the display show optioncode B for approx. 2sec. a.s.o.
To quit the service test program press the STAND BY button.

2.10 Endurance test

A recorder endurance test can be carried out in the service test program. For this purpose, insert tape and set recorder to "PLAY", "REC" or "REWIND" position. The functions are then continuously carried out. This test serves to detect intermittent faults. The last occurred fault is stored in the EEPROM (it remains stored even in case of power failure).
The endurance test is terminated by quitting the service test program.

Option - list

	OPTION A		OPTION B		OPTION C		OPTION D		OPTION E	
	decimal **input**	hexa - decimal **check**	decimal **input**	hexa - decimal **check**	decimal **input**	hexa - decimal **check**	decimal **input**	hexa - decimal **check**	decimal **input**	hexa - decimal **check**
BV-245 EC	000	00	000	00	000	00	064	40	001	01
BV-245 EGC	000	00	000	00	001	01	064	40	001	01
BV-245 OIRT	000	00	000	00	001	01	069	45	129	81
BV-445 OIRT	000	00	000	00	001	01	069	45	151	97
RTV-205 PSW	001	01	000	00	000	00	067	43	001	01

SERVICING OF SMDs
(Surface Mounted Devices)

1. General cautions on handling and storage.

Oxidation on the SMDs terminals results in poor soldering. Do not handle SMDs with bare hands.

Avoid for storage places that are sensitive to oxidation such as places with sulfur or chlorine gas, direct sunlight, high temperatures or a high degree of humidity. As a result the capacitance or resistance value of the SMDs may be affected.

Rough handling of circuit boards containing SMDs may cause damage to the components as well as the circuit boards. Circuit boards containing SMDs should never be bent or flexed. Different circuit board materials expand and contract at different rates when heated or cooled and the components and/or solder connections may be damaged due to the stress. Never rub or scrape chip components as this may cause the value of the component to change. Similarly, do not slide the circuit board across any surface.

2. Removal of SMDs

Heat the solder (for 2-3 seconds) at each terminal of the chip. Small components can, by means of litz wire and a limited horizontal force, be removed with the soldering iron. They can also be removed with a solder sucker (see Fig. 1A) or

While holding the SMD with a pair of tweezers take it off gently using the soldering iron's heat applied to each terminal (see Fig. 1B).

Remove the excess solder on the solder lands by means of litz wire or a solder sucker (see Fig. 1C).

Caution on removal :

When handling the soldering iron, use suitable pressure and be careful.

When removing the chip, do not use undue force with the pair of tweezers.

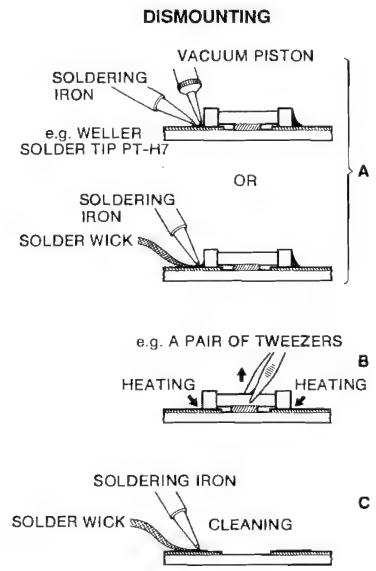


Fig. 1

The soldering iron to be used (approx. 30 W), must preferably be provided with a thermal control (soldering temperature about 225 to 250°C).

The chip, once removed, must **never** be used again.

3. Attachment of SMDs

Locate the SMD on the solder lands by means of tweezers and solder the component at one side. Ensure that the component is positioned well on the solder lands (see Fig. 2A).

Next complete the soldering of the terminals of the component (see Fig. 2B).

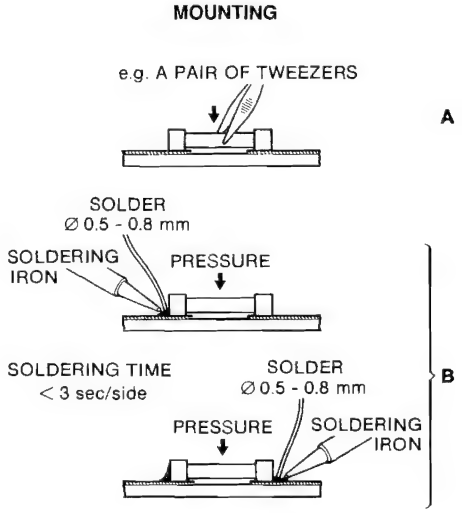


Fig. 2

Caution on attachment :

When soldering the SMD terminals, do not touch them directly with the soldering iron. The soldering must be as quick as possible; care must be taken to avoid damage to the terminals and the body itself.

Keep the SMD's body in contact with the printed board when soldering.

The soldering iron to be used (approx. 30 W) must preferably be provided with a thermal control (soldering temperature about 225 to 250°C).

Soldering should not be done outside the solder land.

Soldering flux (of rosin) may be used but should not be acidic.

After soldering, let the SMD cool down gradually at room temperature.

The quantity of solder must be proportional with the size of the solder land. If the quantity is too great, the SMD might crack or the solder lands might be torn loose from the printed board (see Fig. 3).

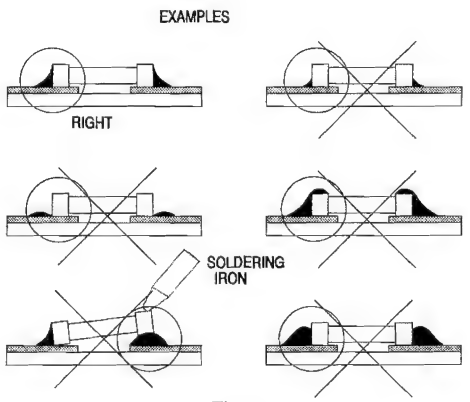
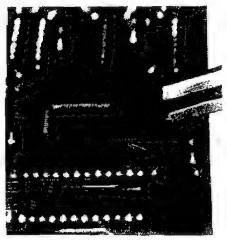


Fig. 3

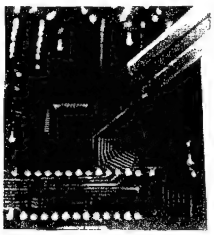
FLATPACK REPLACEMENT

TOOLS TO BE USED

DISMOUNTING

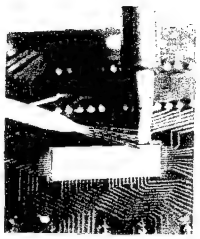


CUTTING
THE LEADS

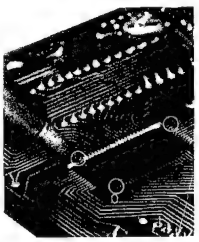


WRONG
TRACKS WILL
BE DAMAGED

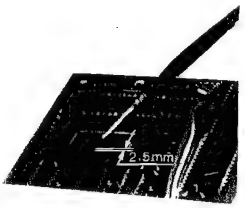
CLEANING
THE TRACKS



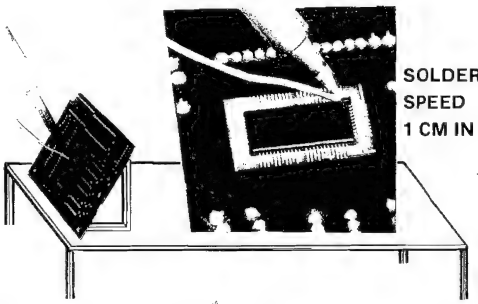
MOUNTING



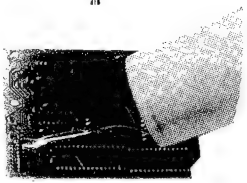
FIXING IC
AT THE CORNERS



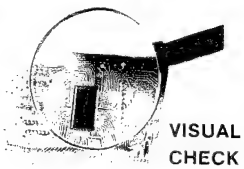
APPLYING FLUX



SOLDERING:
SPEED
1 CM IN 5 SEC.

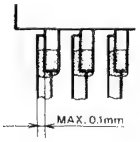


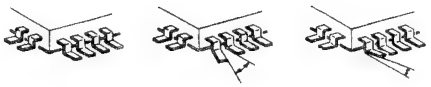
DRYING



VISUAL
CHECK

ALIGNING THE LEADS





RIGHT WRONG WRONG

SOLDERING

RIGHT WRONG WRONG

Removal of case components and sevice positions of printed circuit boards

1. The casing cover

Dismounting :

- Unscrew the screws A, B, C, D, E, F and G (see fig. 1).
- Pull back the casing cover for appr. 1 cm, and when the side panels are being slightly pressed outward, the cover can be taken off.

Assembly :

- Place the front groove tightly on the front panel.

Then carry out the assembly in reverse order.

2. The bottom plate

- Place the unit with the bottom side up.
- The bottom plate can be lifted off by releasing the six snap hooks (see fig. 2).

3. The front panel

- Remove the casing cover (see point 1).
- Press the two snap hooks on the left and the two snap hooks on the right at the front outward.
- Press the front at the top slightly forward, release the 3 snap hooks at the bottom side of the front and pull forward (see fig. 3).

Note :

For assembly, the front panel has to be slipped on in parallel to the control print. For this purpose, the lever which serves to open the lift flap has to be pushed into the flap guide.

4. Power supply NSM

The NSM can be removed from the unit by releasing the two snap hooks (see fig. 4).

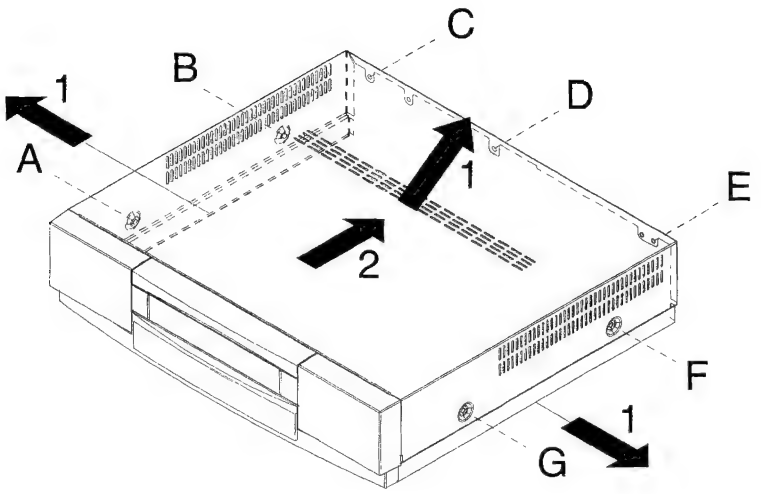


Fig. 1

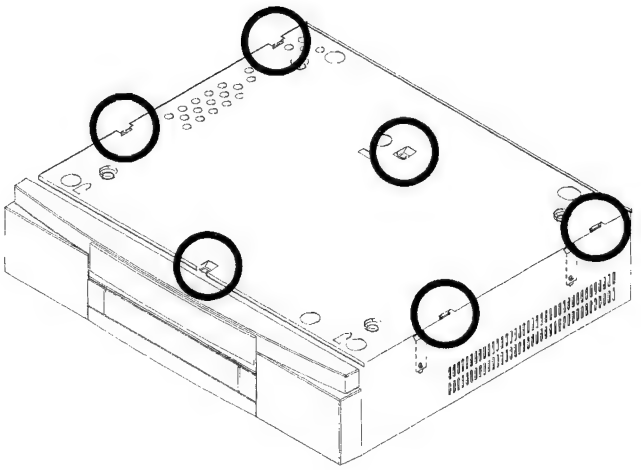


Fig. 2

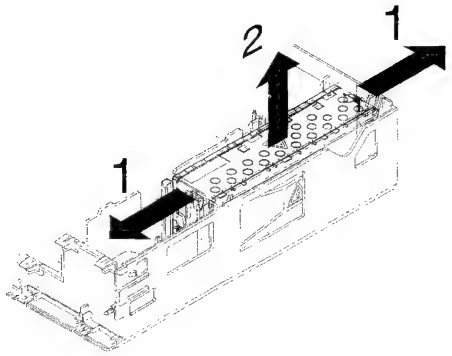


Fig. 4

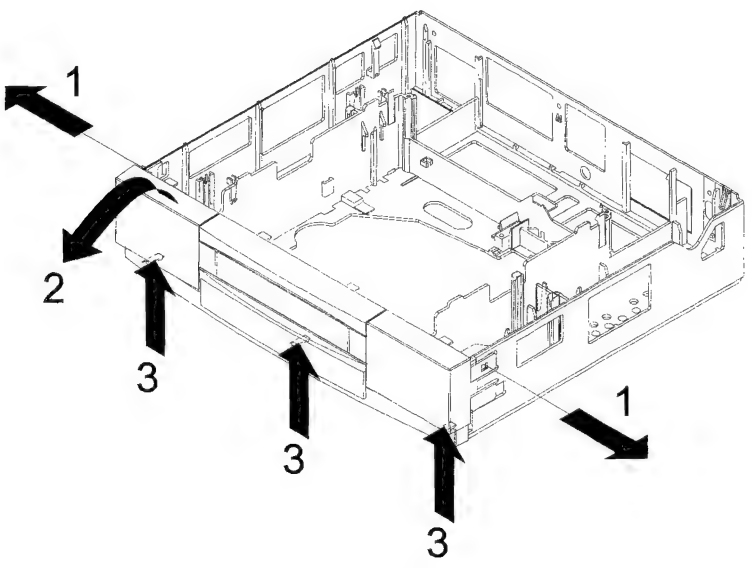


Fig. 3

5. Control print ODC

- Remove the front panel see point 3.
- The control print can be removed by releasing the snap hooks (see fig. 5).

6. Family board OFB

- Release the 4 snap hooks (see fig. 6).
- Now lift the OFB turn it into the service position (see fig. 7) and place it into the slots provided.

7. The Tape deck

- Remove front panel and cover, see point 1 and 3.
- Unlock the 2 lift locks and manually move the lift 5 cm to the rear.
- Unscrew the 3 screws V,R,S (see fig. 8).
- The whole tape deck can now be removed from the frame.

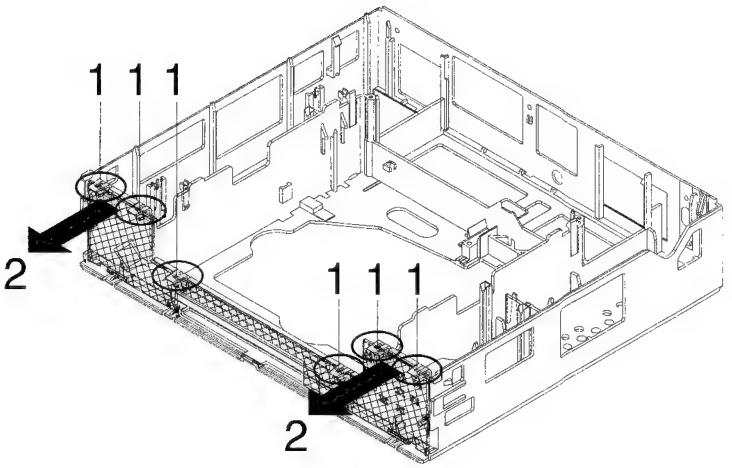


Fig. 5

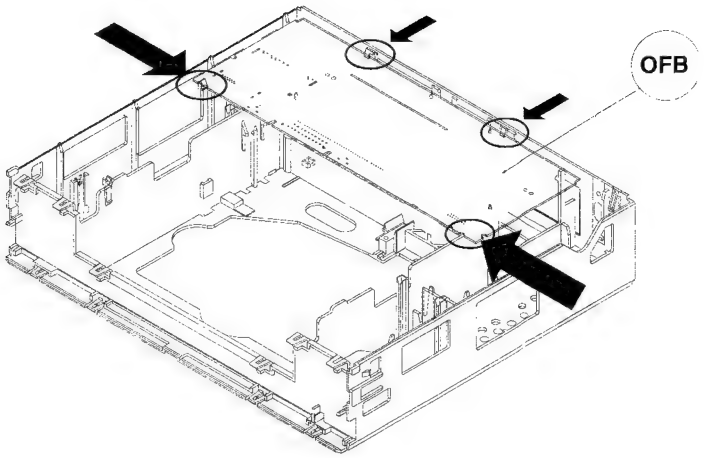


Fig. 6

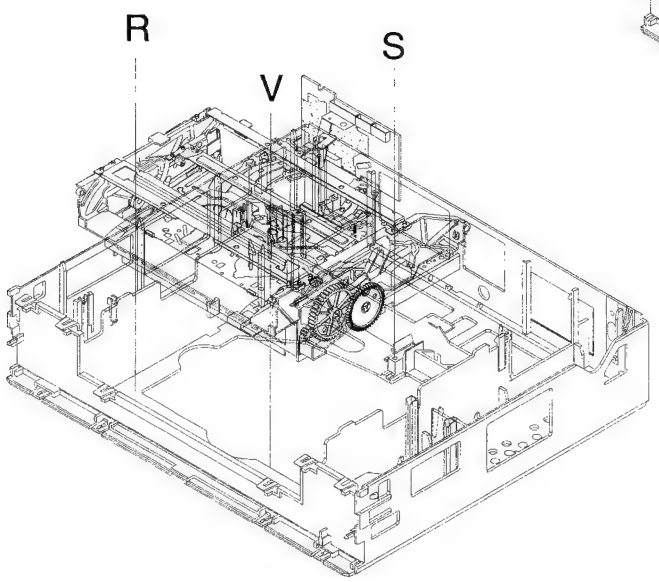


Fig. 8

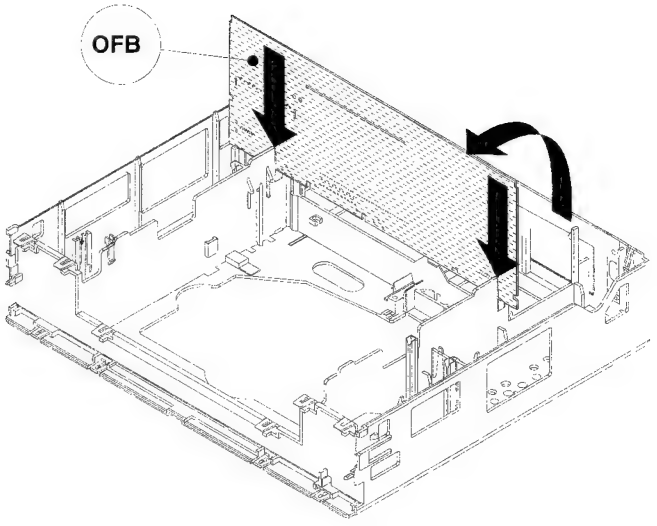


Fig. 7

Circuit descriptions

ODC Control UNIT

The microcomputer IC7101 is the heart of the control unit and takes over the following functions with the respective function groups:

- Evaluation of the keyboard matrix.
- Decoding of remote control commands from the infrared receiver IC7103.
- Quartz clock
- Integrated RAM for storing timer data
- Display control
- Bi-directional serial interface for the data exchange between operator and sequence control computer.
- I^2C bus interface (SDA - pin 79, SCL pin 23) to EEPROM, IC7412 on the motherboard. It is also used as serial data bus output in connection with STROBE pin 27.
- Generation of tuner tuning voltage by pulse-width modulation at pin 80 (5V level) for coarse tuning with 8-bit resolution (VST sets).
- Generation of tuner fine tuning voltage with 6-bit resolution and band selection (2 bit) in connection with serial interface SDA, SCL and STROBE (VST sets).
- The drifting of the tuner or the aerial signal generates the AFC control voltage in the reception circuit on the motherboard. This voltage is supplied to pin 78 and the operator computer readjusts the tuner tuning voltage.
- In case of power failure the backup cell at pin 33 supplies the clock and the RAM depending on the model for 10s (C2999, 470 µf electrolytic capacitor) or for 7 h (C2998, 220 mF gold capacitor). The diode D6099 prevents the C2999/C2998 from discharging. During this period a LOW level exists at pin 2 so that further functions of the IC are switched off by the system quartz Q1001 at pin 13 / 14.

Switched-mode power supply NSM1 (PS)

Typical data :

Mains voltage:	196 - 265 V_{rms}
Max. power:	40 W
Switching frequency:	30-220 kHz

Efficiency: 78% at max. load
All outputs are short circuit protected

1. Functional description (blocking oscillator principle) :

During the forward phase of the switching transistor energy is transferred from the mains to the transformer. During the blocking phase this energy is supplied to the load. Using the switch-on time, the energy transferred in each cycle is regulated so that the output voltages are not affected by load or input voltage variations. The power transistor is controlled by integrated circuit TDA4605 or SPH4690, [Y7005/7007].

2. Description of different load conditions :

No-load operation :
The SMPS operates in **burst mode**, i.e. it stars up (relative long delay time) and is switched off by the IC after a few cycles as the output voltage becomes too high. After the fall of the output voltage the SMPS will start again.

Control range :
The switching frequency is reduced with increasing load. The duty factor is mainly controlled by the mains voltage. The output voltage is only insignificantly load dependant.

Reversal point :
At this point of the output characteristics maximum power is transferred.

Overload :
The power supply also operates in **burst mode**. The energy in each cycle is limited so that the output voltage is reduced.

3. Circuit description :

The supply voltage is filtered by a filter around spool [5050], rectified by bridge rectifier [6070] and filtered by [2070]. [2030] is loaded via [3052, 3054, 3056, 3058] and serves as voltage supply for IC [Y7005/Y7007] during the start-up phase. After the start-up transformer windings 1-9 take over the supply via [6027].
The power transistor BUK455-60[Y7007]/[7035 external!] is the switching transistor of the power supply. The inductivities of primary windings 6-7 determine the system frequency of the circuit.
During the forward phase current will flow from the positive supply voltage through the transformer's primary winding and the transistor to ground. As the positive voltage at pin 7 of the transformer is constant (for this example), the current rises linearly creating a ramp depending on the mains voltage and the inductance of the primary winding. A certain amount of energy is stored in the transformer in the form of a magnetic field. The secondary voltage is of such polarity that the diodes are non-conducting.
Capacitor [2015] is loaded, creating a saw-tooth voltage representing the primary current. At the same time the voltage is checked and the switching transistor is turned off when the voltage reaches a certain value depending on the regulating voltage on pin 1 of the IC. The dimensioning of [2015] and [3011] ensures that the transformer core will not be saturated.
When the switching transistor is switched off, energy is no longer supplied to the transformer. The inductance of the transformer now strives to maintain the current which has been flowing through it at a constant level (u=L*di/dt). Consequently the polarity of the transformer voltages reverses causing a current to flow through the transformer's secondary winding via the diodes, electrolytic capacitors and the load. This current is also ramp shaped (but decreasing).
After all the energy stored in the transformer has been supplied to the load and the magnetic field has disappeared, the voltages from the secondary windings fall below the output voltages - maintained constant by the electrolytic capacitors - and the threshold voltage of the diodes. Consequently the current stops in the secondary windings. At this point the drain-source voltage of the switching transistor is not yet zero as capacitor [2060] contains a certain charge. This charge commences a cosine-shaped discharge determined by the transformer's self-induction. Once this discharge passes through zero the TDA4605[Y7007]/[7005] detects this at pin 8/18. The switching transistor is now switched on again and a new cycle starts.

The switching power supply is regulated by altering the conductive time of the switching transistor so that either more or less energy is transferred from the mains to the transformer. The control information stems from reference component [7085] which monitors the output voltage of the switching power supply. This output voltage is fed to pin 1 of TDA4605[Y7007]/[7005] via an opto-coupler (for electric isolation). TDA4605[Y7007]/[7005] compares the voltage to an internal reference.

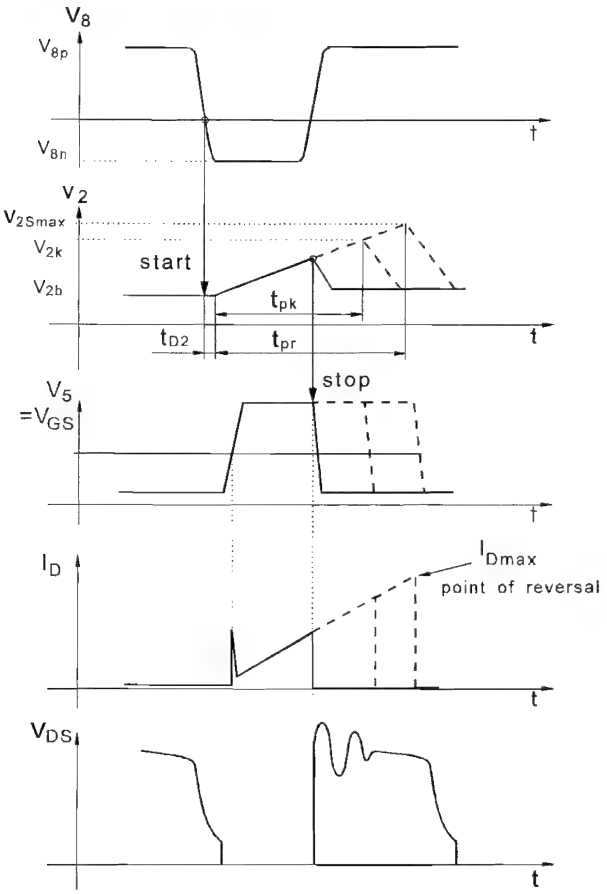


Fig. 1

The resulting value shifts the level with which the voltage is compared at pin 2 of the IC (the image of the primary current).
[7085] is a reference element with an internal 2.5 V reference voltage and a compare circuit.
[3040, 3042, 3044, 2040] and [6040] form a snubber network limiting the peak voltage at switch-off.
The ringing occuring in both voltages and currents is caused by stray selfinductances in the transformer. Therefore a passage through zero at pin 8[18] of TDA 4600[Y7007]/[7005, pin 8] will be ignored after the switching transistor has been switched off (4µs internally fixed).
The voltage of pin 3 of TDA4605[Y7007]/[7005] is required for the reversal point current serving as additional correction current for capacitor [2015]. This current shortens the on-time of [Y7007]/[7035 external!]. The reversal point is also stable at higher mains voltage.
The protective circuit at pin 7[17] is an IC option. Using [2023] the start-up phase is carried out with shortened pulses so that the switching frequency is beyond the audible range.

On the secondary side 5 voltages are available, rectified by [6155...6180] and filtered by [2102-2185].
[Y5123...5184] are RF-filter coils which block disturbances caused by clock frequencies of µPs.

Description of "start-up phase" :

After connection to the mains the following voltages are increasing at the pins of [Y7007]/[7005] at time t_o (see Figure 2):

- V_6 corresponding to a half wavelength charge via [3058,3056,3054,3052]
- V_2 to V_{2max} (typical 6,6 V)
- V_3 to the fixed value of voltage divider [3005, 3007]

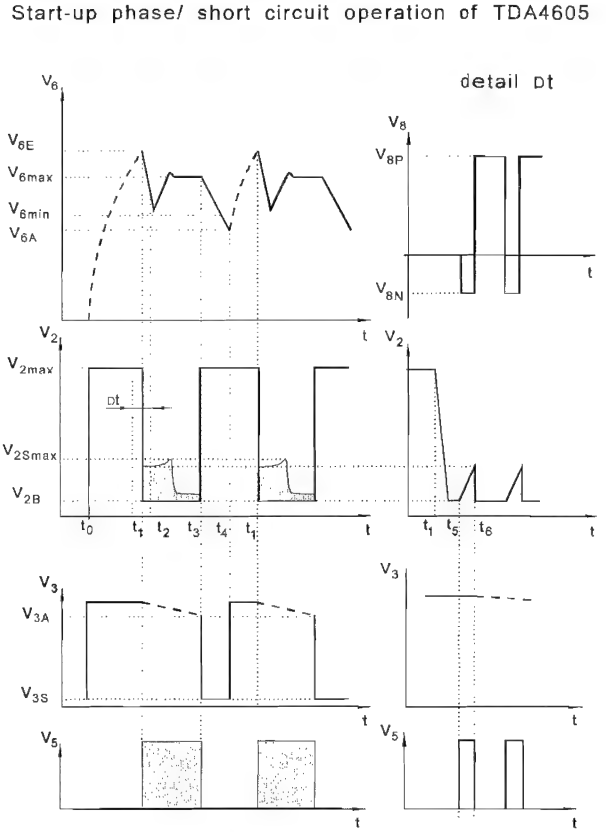


Fig. 2

The current consumption is in this case [0,8] mA. The internal reference voltage of the IC is switched on at time t_1; if $V_6=V_{6E}$. The current take-up rises to 12 mA max. The primary current to voltage converter controls $V_2=V_{2B}$ and at time t_5-t_6 a starting pulse is generated at p in [15/5]. The feedback at pin [18/8] starts the next pulse and so on.
The feedback at pin 8[18/8] starts the next pulse and so on.
All pulses, start-pulse included, are pulse width controlled by the regulation voltage at pin 1. This voltage corresponds to a short circuit situation.
The start up is triggered by "short circuit pulses" being extended depending on the regulation voltage.
At time t_2 the maximum pulse width occurs ($V_2=V_{2Smax}$) . TDA4605[Y7007]/[7005] is now in the reversal point. V_2 peaks decrease rapidly as the circuit is within the regulation range. The regulation-loop is locked.
If V_6 drops below the limit value V_{6min} before reaching the reversal point, the start-up will be stopped (pin [15/5] is switched off) and V_6 decreases to V_{6A} - the IC is switched off. At time t_4 V_6 rises by a half wavelength charge - a new cycle starts.

4. **Regulation-range, overload and no-load :**

After start-up the IC is within the regulation range. A typical voltage at pin 1[1] is 400 mV. In case of an increasing secondary side load the switch-on time will also be increased. The peak voltage value at pin 2[2] also rises to V_{2Smax}. If the load increases further, the overload amplifier starts to reduce the pulse width of V5. This point is called "reversal point". The IC supply voltage V_6 behaves like the secondary voltage value. Consequently V_6 decreases with increasing load.
At condition $V_6 << V_{6min}$ TDA4605[Y7007]/[Y7005] changes to burst mode (polling operation mode). The short circuit power is small due to the time delay between the half wavelength start-ups being high. The overload amplifier reduces the pulse width to a certain value (tpk-mark). This minimum pulse width must be guaranteed as it is active in each start-up phase (V_1=0 V).
With decreasing load the pulse width is also decreased. The switching frequency is increased to the system frequency of the SMPS. If the output voltage is increased to $V_6=V_{6max}$, the logic will be blocked and the TDA4605[Y7007]/[7005] will be in burst mode. The SMPS works in open circuit operation.

Overtemperature :

The TDA4605[Y7007]/[7005] contains an overtemperature circuit blocking the logic if the chip temperature becomes too high. A renewed start-up is possible after cooling down.

Audio linear - AL

The signal input for Record or EE Mode is pin 11 of LA 7282. (ALC, automatic level control). At Record and EE the signal runs through a mute stage leaving the IC at pin 13. This is the output to the I/O section. The attenuator chain on pin 13 sets the necessary level for the ALC detector with its time constant on pin 10 and for the recording amplifier, with L 5601, R3616 and C 2613 forming the pre-emphasis components.
The recording amplifier output is pin 17. The recording current is added to the bias current and passed via the head to pin 2 where the switch is closed. In PB mode pin 1 is closed. The PB signal is amplified in the equalizing stage (time constant between pin 6 and pin 8) and is adjusted with R 3606. 3606 compensates amplifier and head sensitivity. The resistor 3601 and the capacitor 2600 determine the head resonance during PB.
In the LP mode the frequency characteristic is adapted by RC networks on pins 4, 5 and 15. The well-known circuit oscillating at approx. 70 kHz forms the erase oscillator for the erase heads and bias current. To avoid clicks, the oscillator must be switched on slowly (switching stage T 7604, time constant C 2617, R 3623, and current limiter R 3625).

Frontend - FV

The receiving part for /01 and /05 sets consists of the following blocks:

1.) Tuner
2.) IF amplifier and demodulator IC TDA 5950
3.) IF amplifier and demodulator IC TDA 9812
4.) AM demodulator IC TDA 9812

The Front End was designed for the reception of the following systems:

PAL B/G	=/01	
PAL I	=/05	
PAL B/G, SECAM D/K	=/59	not corresponding to EN55020
SECAM L,L'	=/19	
SECAM L,L', PAL B/G	=/39	
PAL B/G, SECAM D/K	=/59	corresponds to EN55020

The receiving section consists of the following blocks: Olivia ECO sets use tuners UV916E for /01, /19, /39 and /59 and U944C for /05, both with internal PLL.

1. Tuner and IF selection :

The intermediate frequency of the vision carrier is 38.9 MHz with the exception of SECAM L' for which the intermediate frequency of the vision carrier is 33.9 MHz. Consequently the AFC circuit has to be switched from 38.9 MHz to 33.9 MHz.
The surface wave filters for /19 and /39 have 2 Nyquist slopes.
Consequently both signals with 33.9 MHz and 38.9 MHz-SC are correctly offered to the demodulator IC ([C77011], TDA9812).

2. IF amplifier and demodulator IC 5950 :

The IF out signal passes from tuner pin 17 via the SAW filter to the 3-stage IF amplifier TDA5950 [7772].
The Video IF wide-band amplifier supplies a quasi-synchronous demodulator for negative modulated IF signals. A separate video output pin 14 enables the use of one or more traps on the input of video switch pin 13.
The RF-AGC transfer point is defined by an adjustment controller at pin 2 to obtain a good signal-noise ratio and an optimum signal.
At pin 7 a demodulated video signal for descrambling is available.
Pin 8 passes either the demodulated or external video.
The FM audio demodulator accomodates a frequency of 4.5 to 6.5 MHz. The demodulated audio output signal is provided to the following circuits via an output and input selection switch. The audio signal output at pin 19 is approximately 250 mV_{RMS} if an audio carrier with 1 kHz FM modulation and +/- 27 kHz stroke is applied.
The AGC voltage (pin 3) is fed to a respective input of the TVC micro controller which sends signal strength information to the microprocessor on the front panel. This is done to determine the sequence of programs to be stored in the autostore mode.

3. IF amplifier and demodulator IC TDA 9812:

For /19, /39 and /59 sets corresponding to EN55020 TDA9812 is used. To gain the respective selected IF signals these are determined for /39 and /59 by switachable filters.
The TDA 9812 is a PLL - type demodulator.
The built in VCO operating at the double vision carrier frequency is adjusted by the coil AFC-Adj.
The loop filter is connected to pin 5. The VCO voltage is used for generating the AFC voltage on pin 20.
The demodulated video signal passes via a 12 MHz low pass filter to pin 18 with a level of 1 V_{pp}. This level is controlled by an AGC circuit with an internal reference level. The sound carrier is then suppressed in the trap and the video signal amplified to 6 dB is then available at pin 8 with 2 V_{pp}.
The Sound IF is filtered in the bandpass pin 17 and passed to the input of the adjustment free FM PLL sound demodulator (pin 15). The audio signal output at pin 10 is approximately 350 mV_{RMS} if a carrier modulated with 1 kHz and +/-27 kHz FM modulation is connected.
The RF-AGC transfer point is defined by an adjustment controller at pin 4 to obtain a good signal-noise ratio and an optimum signal.
The AGC voltage (pin 25) is fed to a respective input of the TVC micro controller which sends signal strength information to the microprocessor on the front panel. This is done to determine the sequence of programs to be stored in the autostore mode.

4. AM demodulator IC TDA 9812 : (/39 only)

In case of SECAM L the amplitude modulated sound carrier (32.4 MHz) arrives at pin 2 of the SAW filter [1722] and returns filtered to the AM demodulator TDA 9812.
In case of SECAM L' the sound carrier is at 40.4 MHz due to the interchanged PC and SC.
The control signal SECAM BAND 1 (SB1) is diode switched to pin 1 of [1722] (40.4 MHz BPF).
The demodulated signal is passed to the integrated switch of TDA 9812, which selects between FM and AM sound pin 10 in multi-standard versions.

Video signal processing - VS

Switch-over functions of signal electronic IC LA7437:
REC/PB:
The switch between REC and PB mode is controlled by the 5 VPB voltage via pin 6 diode 6000.:

PB	> 3.8V
REC	< 3.8 V

NTSC/SECAM BG/PAL
The switching between colour systems (NTSC PB only) is triggered by the pin 30 voltage (INTSC):

NTSC	>3.3 V
(ME-)SECAM B/G	= 1.8 ... 2.7 V
PAL	<1.2V

SP/LP/SLP
The switching of speed modi (NTSC: SP/SLP, PAL/SECAM: SP/LP) is triggered by pin 25 voltage (LP):

SLP	> 3.3 V
LP	= 1.8 ... 2.7 V
SP	< 1.2 V

VIDEO INPUTTING
The artificial image pulse of the playback features and the test pattern for the set installation is input at pin 19 (FFP):

Loop through	< 0.8 V
Test pattern	= 1.2 ... 3.3 V
Artif. image pulse	> 3.7 V

COLOUR VECTOR
The colour vector is influenced with pin 27 (HSC2):

normal	< 1.2 V
LP features colour ( )	= 2 ... 2.7 V
NTSC playback colour	> 3.9 V

FEATURE
Pin 39 (CKPAL) is set to > 3.9V in the feature modes.

Recording:

1. Luminance:

Pin 12 is the input of the video signal with $1V_{SS}$ (VBS). In the IC 7051 the video signal first passes though an amplification control (time constant determined by C 2023). From the AGC the signal path branches to be looped through by the signal electronics via the clamping, output amplification and emitter follower and for further signal processing in the signal electronic IC. The latter passes via a 6 dB attenuator, is clamped to a direct voltage level and passes via a 3.5 MHz low pass filter to the chrominance arrester and the vertical emphasis. This contains a 1H-CCD delay line in IC 7060 (passing via pin 20, returning via pin 18). Then the signal passes via an internal amplifier/impedance transformer and an external emitter follower (pin 4). The filter at the base of the emitter follower does not operate in the REC mode due to the low resistance of the emitter follower. The Y signal then passes through the detail enhancer, the linear and non linear pre-emphasis (time constant determined by the protective circuit of pins 6, 7, 8) and the white/dark clipping stage. The thus generated signal then directly controls the FM modulator. The Y FM signal leaves the IC 7051 via pin 2 and continues via an emitter follower and a low pass filter before being passed to the head amplifier print OHA 1910 as FMRV signal.

2 Chrominance PAL :

The chrominance signal is separated from the arriving video signal (pin 12) via a bandpass filter and continues via 2 switches to the ACC stage. The ACC amplifier stage controls the chroma amplitude for the succesive stages (time constant via capacitor to pin 41). The chrominance signal is then passed to the main converter. The main converter mixes the 5.06 MHz - auxiliary carrier of the secondary converter with the 4.43 MHz chrominance signal to the 627 kHz output signal (to pin 38). The auxilliary carrier is a mixture of 4.43 MHz (the REC-APC, time constant to pin 33, compares quarz and burst frequency) and (40+ 1/8) f_H= 627kHz (generated by $321f_H$ - VCO, time constant pin 36/37 and phase rotation to VHS standard, control pin 17).

Via a band pass filter and the colour killer stage the converted chrominance signal arrives at pin 38 of the IC from where it is directly added to the Y-FM signal via an adjustment controller. The colour killer can either automatically identify the arriving signal (PAL yes/no) or can be activated by control line CKPAL at pin 39 (forced mode: PAL < 2.5 V, SECAM L > 2.5 V). The burst gate pulse is generated in the BGP generator depending on the sync separator and is output at pin 35. This signal is required by the SECAM (B/G) / MES detector (7070) to distinguish between an arriving PAL or SECAM B/G signal. The quarz oscillation (pin 32) serves apart for the chroma processing also to generate the clock frequency in the SEACM B/G detector (7070, pin 8) and that of Kombi-CCD (7060, pin 12).

3. SECAM B/G :

The signal path is nearly identical to the PAL path.
The differences are:

- No phase rotation
- The filter characteristic of the chroma band passes becomes wider
- Free-running quarz frequency
- The SECAM B/G detector IC 7070 generates the triggering voltage at pin 30

4. SECAM L

Circuit description see OIO.

Playback:

1. Luminance:

The FM playback signal passes from the head amplifier print OHA (1919) as FMPV to the signal electronics. The signal is amplified and filtered by the FM processing and passes via pin 1 to the signal electronic IC 7051 where firstly the level of the envelope is regulated (FM-AGC, pin 10), limited by a double limiter and the signal is FM demodualted and filtered by a low pass filter. The demodulated Y signal still contains the recording pre-emphasis. This eliminates now the linear de-emphasis at the base of the emitter follower 7007. Furthermore the frequencies are peaked by approx. 2 MHz. The filter circuit is acitve as pin 4 becomes an open collector output in the playback mode whose load impedance depends on the de-emphasis/Peaking circuit. The Y signal is then clamped, filtered by a low pass filter and passed via the vertical noise canceller or dropout compensator. For this purpose the Y signal leaves the IC 7051 and is delayed in the IC 7060 by 1H (out at pin 20, in at pin 18). The CCD 1H delay line serves the Y signal as comb filter (vertical noise canceller) and as line store for the dropout compensation. Sequential circuit stages are: the non linear de-emphasis, the horizontal noise canceller and the picture control circuit to increase edge steepnes (sharpness). The chrominance signal is then added to the luminance signal (pin 16).

2. Chrominance PAL :

The FMPV signal is passed via pin 38 to the signal electronic IC, from which the subsequent low pass filter filters the 627 kHz signal. The ACC amplifier amplifies and controls the chrominance amplitude. In the main converter the chrominance signal is mixed with 5.06 MHz back to the original 4.43 MHz. The 5.06 MHz are generated during playback from the free-running oscillator and the (40+1/8) f_H = 627 kHz frequency derived from the $321f_H$ - VCO. After the main converter the chrominance signal is largely cleaned from the neighbouring track crosstalk by the 2H comb filter (CCD-IC 7060). The chrominance signal is then filtered by the band pass filter, checked by the colour killer looped through by pins 28 and 29 and is finnaly added to the Y signal.

3. Chrominance SECAM B/G :

The signal path is nearly identical to PAL.
The differences are:

- The 321 fH VCO is synchronised by the sync
- No phase rotation
- The comb filter is off
- The internal bandpass filters have a wider bandwith
- No colour killer function, colour is always on

4. Chrominance SECAM L

The chrominance signal is fed in at pin 29, for further circuit description see OIO.

5. NTSC

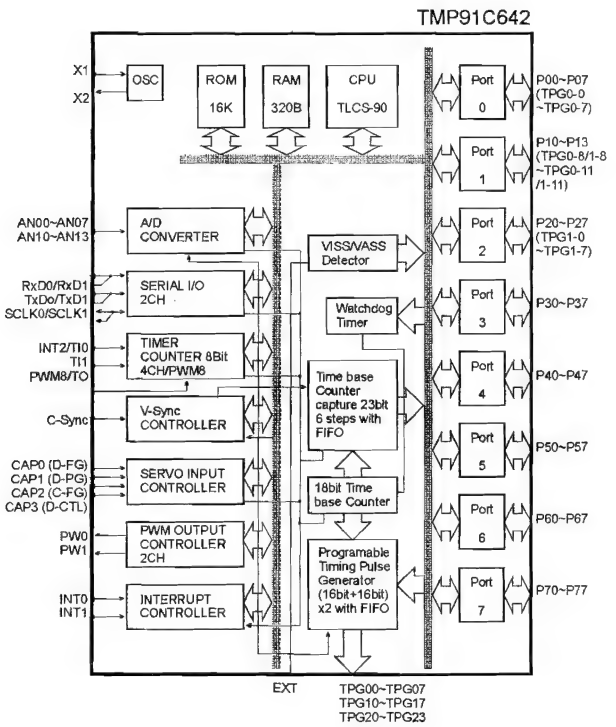
During playback of NTSC signals the original NTSC chrominance is converted to a PAL chrominance signal (control signal see above). This requires an internal IC switching in the chrominance part as well as a switching in CCD-IC 7060 onto a 1H comb filter for cross-talk attenuation. Line and immage frequency, however, remain unchanged as NTSC standard.

Deck electronics - DE

1. General :

The TVC (Toshiba Video Controller) is a one chip microcontroller with the following functions.

- 12k byte ROM
- 320 byte RAM
- 8-bit A/D converter
- 2 serial bus interfaces
- 2 12-bit PWM outputs
- 1 8-bit PWM output
- Composite sync input
- Special servo inputs



The TVC contains two serial interfaces for data exchange with other µP's. The element is supplied in QFP (64 pin) or SDIP housing (64 pin).
Four analogue outputs are available each with 8 bit resolution. The maximum processed input voltage range is 0 ... 5V (determined by the reference voltages AVSS and AVCC). Three analogue outputs are available, two with 12 bit and one with 8 bit resolution. The outputs supply a signal with a constant frequency (PWM8 approx. 20 kHz, PWM1, PWM2 approx. 39 kHz) with variable pulse/pause ratio.

2. SAA 1310 interface DM - DE :

a) CTL stage :

The IC SAA 1310 contains a write/read stage for the CTL track, with the possibility of interference-free overwriting of an existing CTL track. The playback stage contains a "digital", two-stage AGC. Using comparators, this circuit logic identifies the size of the output signal supplied by the CTL head and then selects the best amplifier gain in the playback stage. The CTL head voltage can therefore vary considerably if V_{max} / V_{min} >>. The LP mode has the slowest tape speed. The highest speed sets in with FAST WIND or FAST SEARCH. To ensure that under the above conditions the pulse/interval ratio of the tape sync is always correctly reproduced (important for recognising VISS marks), the amplifier must not be overdriven.
The two-stage AGC cannot process the large dynamic range of the input voltage on its own. The amplifier contains therefore also an internal low pass feature (fg = 3 kHz typ.) (internal). The amplification is also further reduced for all winding modes by transitor 7403.
In this case, the signal IWIND = "L" and T7403 is disabled. The transistor is deliberately polarity inverted, as the inverse operation has better attenuating qualities for this application. If T7403 is disabled, the amplification is determined mainly by the internal negative feedback resistors of the SAA 1310 and the external resistor 3454. By random short-circuiting R3454 with T7403 the amplification can be reduced in the following ratio:

V on / V off = 1 + R3454 / 100

Situated parallel to the CTL head is the R.C. circuit of C2411 and R3453. Together with the CTL head inductance, the capacitor causes a resonance peaking at approx. 10 kHz. The R3453 attenuates this peaking and causes an aperiodic transient response of the resonance. A steep fall of the frequency transmission characteristic occurs beyond resonance, providing an effective suppression of high-frequency stray pickup. The CTL head signal amplitude in SP is approx. 1 mVpp (typical). Therefore the gain of the playback amplifier has to be correspondingly high. To avoid offset problems, a 47 µF electrolytic capacitor (C2410) is integrated in the negative feedback branch for DC decoupling. The polarity of the playback amplifier can be reversed with the Capstan-Reverse (CREV) voltage. This enables the TVC to always "identify" the correct sync edge as falling edge independent of the tape feed direction. The W/R (Write/Read) signal changes between record and playback.

W = high and R = low.

b) POR (Power On Reset) generator :

The POR generator contained in the SAA 1310 requires only one external capacitor C2414 defining the length of the POR pulse.
At 33 nF, tpor is approx. 30 ms. The response threshold is at approx. 4.5 and 4.8 V. Supply voltage interruptions shorter than t_{por}/100 and not falling below a 3.5 V level do not trigger a POR.

c) The sensor interface :

The four comparators in the SAA 1310 are used to convert sensor signals to logic levels. Two of these comparators have open collector outputs (pins 11 and 13), which can source a current of 100 mA. The outputs are overload protected by a current limiter and thermal shutdown. Only the non-inverting input of each comparator is accessible from the outside. The other inputs are connected to the internal reference voltage of 2,5 V nom. The fixed hysteresis of the comparators of approx. 10 mV is also internal.

The following sensors are evalutated:
Comparator 1: In = FTA, pin 5; Out = FTAD, pin 15 :
FTA = threading tachometer. This signal is provided by a forked light barrier in the deck. An infra-red light beam is interrupted by a four-blade impeller (butterfly). The output amplitude of the light sensor has to have a minimum variation of between 2V and 3V to ensure correct evaluation. Using R3449, an additional hysteresis is obtained.

Comparator 2: In = WTR, pin 6; out = WTRD, pin 14:
WTR = Winding tachometer right, stems from a reflected light beam. The same minimum output requirement as for the FTA applies.

Comparator 3: In = WTL, pin 7; out = WTLD, pin 13:
WTL = Winding tachometer left, see above (not for ECO).

Comparator 4: In = FG, pin 8; Out = FGD, pin 11:

FG = Capstan tachometer. This signal stems from the sensor print from a tachometer HALL sensor amplifier in the motor unit. The output impedance is approx. 10 kOhm. The amplitude of the near sine-shaped signal is typically 1 Vpp. The minimum acceptable level is 300mVpp. The signal is AC-coupled via C2415. To enable a bias current the input at pin 8 is connected to the reference voltage at pin 3 via resistor 3452. The capacitor C2413 parallel to 3452 serves to remove high-frequency noise.

3.Interface to the headwheel motor driver :

The connection to the HMO driver TDA 5140 on OHA print is via connector 1915.

REEL is the speed/phase regulating signal.
The resolution is 14 bit.

PG/FG is the combined POS/tachometer signal of TDA5140.

The current drawn under ambient temperature from the +14M1 is typically 70mA. During the start-up period of the motor approx. 0.5 A flow for a short time.

4. Interface to the Capstan motor :

a) Motor driver interface :

The Capstan motor turbo drive IC is driven via connector 1913.
CAP is the Capstan speed signal, which can vary without load between 0 and 5 V.

By means of CREV (Capstan reverse) the direction of the motor rotation is changed. The signal is fed via a diode to the motor driver, thus effectively preventing a latch-up (otherwise the current limiter fails). The motor current - especially for a loaded motor - causes a considerable voltage drop on the ground supply lines (print traces, cables, connectors). This increases the ground potential (GNDM1) of the driver IC compared to the control voltages, referring to GNDD. When the ground has been increased by approx. 0.3 V in comparison to the GNDD and CREV = "L", a parasitic clamping current flows through the IC substrate diode. This causes a malfunctioning of the current limiter circuit. The diode in the CREV line prevents a current flow in the substrate diode. The maximum current consumption of the motor is limited to 1 A. Typical values in the PLAY mode are 0,2 ...0,3 A.

b) Tachometer preamplifier :

The tachometer preamplifier is arranged inside the deck and discretly designed as a DC coupled differential amplifier. AC and DC amplification are different to avoid problems with the offset of the MRH element. Common-mode signals are suppressed by 11 dB at 1 kHz with an AC amplification of typically 26 dB at 1 kHz.

5. Threading motor driver :

The TMO driver is provided in a bridge circuit using a dual power opamp. L2722. This IC can supply an output current of +/-1A. It contains short circuit and thermal overload protection and integrated fly-back diodes at the outputs. The output voltage is limited to approx. 0.7 A (start or motor blocked) by the internal resistance of the threading motor (typically 18 Ohm).
Between the IC outputs (pin 1 and 3) a Boucherot element (1 E5, 100 nF) is arranged to suppress a 3 MHz spurious oscillation from the power amplifier. One half of the bridge is controlled via the TMO line and functions as comparator. The other half is an amplifier-integrator with a 3.9 x gain. A variation of the input voltage (THIO) between 0 and 5V causes a voltage variation at the output between 0V and near supply voltage. In case of a 50% modulation (THIO = 2,5V), pin 3 has approx. 7V. The capacitor in the Opamp negative feedback serves to filter out the PWM frequency of approx. 21,5 kHz. In the event of a Power On Reset, the TVC takes the THIO line "L", whereas TMO is "H". The above polarity must be observed to ensure that no current is applied to the motor during the POR pulse period. This prevents motor damage caused by excessive triggering and blocking. This has, however also the disadvantage that if the 5V supply fails (i.e. fuse 1400 has blown) residual voltages pass to the IC inputs via the still applied 14 V voltages. These activate the comparator and the Opamp contrary to one another leading to a coil short-circuit, in the blocked threading motor. To avoid this problem a separate reference divider (R3438, R3439) is provided for the comparator section. Both outputs of the L2722 are now in common-mode in the event of the above failure.

6. Analogue interface to the TVC :

The following analogue levels are supplied to the TVC internal A/D-converter :

- TRIV Tracking information video
- TAE/TAS Tape end/tape start detection
- I/R Combined information from INIT and record protection
- AGC Automatic gain control

7. Tape end - LED - control :

The LED current is controlled by transistor 7404. The ON time is approx. 1 ms. with an ON/OFF ratio of 0.09. C2404 slightly attenuates the slopes to avoid interference in the audio signal electronics. The LED current is typically 65 mA. To avoid carrying disturbances with the relatively large impulsed current throughout the set, the LED is supplied by the +14M1.

8. Sensing of the drive switches :

The drive contains two switches :

INIT	initialisation switch
RECP	record protection

The state of these two switches can be input with a single line (I/R) in one of the analogue inputs of the TVC (pin 57). For this all switch outputs with a level of either "H" (5V) or "L" (0 V) are coupled via a resistor-driver network (R3444, R3445). Each possible switch combination thus corresponds to a unique voltage level on the I/R line.

9. Test picture generation for non VPT/OSD sets

Using the resistor network R3422, R3424, R3425, R3426 a test picture is generated (sync, black, white) and fed into the signal electronic IC 7051.

10. Version definition :

Only one ROM mask is used. All appropriate settings are stored in the EEPROM as 5 option bytes.

11. EEPROM :

An EEPROM is an electrical erasable and writable non-volatile ROM (information remains if operating voltage fails). The R/W cycle takes place via the serial IIC-Bus SDA, SCL. It is possible to save set or deck-specific parameters, for example, X-distance, gap position, tuning limits (for "Amtsblattfestigkeit) and possibly also differences between TAE and TAS; left and right tolerance of the tape end light barrier (previously coupled photo transistors were used). Consequently the preset potentiometer for the gap position is no longer necessary. The adjustment occurs automatically when using a test cassette and by pressing certain keys. The preset channels and some options are also saved in the EEPROM.

12. CMT detection :

These were extended due to problems with VST sets. The CSYNC wire is connected with two TVC pins. As before, the 50 Hz can be detected on one pin (pin 12, port 33) and additionally the 15,625 kHz can be filtered from another pin (pin 8, port 47), i.e a safeguard was installed so that only real video signals are stored.

IN/OUT - IO - I/O part

1 Scart version with TDA5950:

This IC contains an internal switch for video and audio.

Video:
The video signal is switched via the IS1 line (deck µP 7410) between the input sources VIN1 and the front end video (inside IC TDA5950) and passed to the signal electronic VS via the VBS line.

Audio:
The IS1 line (deck µP 7410) chooses between AIN1 and the front end audio (inside IC TDA5950) and passes one of the two signals to the linear audio / AL AOTDA or AMLR.

General: The IPBV line mutes the input selection during playback, i.e. no signal is passed to the signal electronic VS.

2 Scart version for PAL/SECAM models:

Video:
The following DC free signals are applied to the STV6400 [7552] inputs: VFV, VIN1, VIN2, VSB. In the STV6400 the input for the signal electronic signal VSB (2 Vpp) is provided with a divider (1/2). Outputs pin 15 (VOUT2) and pin 16 (VOUT1) contain a 6dB amplifier. Only OUT1 pin 2 has no amplifier. This output passes to the signal electronic VS VBS. Via the IIC-BUS various imput signals are switched by the controller to the various outputs (see list in IO circuit). To Scart 1 VOUT1 and to Scart 2 VOUT2. Downstream of the signal electronic is a modulator (VSB).

Audio:
There are two HEF4053 ICs selecting from the four audio sources (E1, E2, FV, linear audio) and passing them on to the three audio outputs (E1, E2, linear audio).

a) Decoder switch 1/3 HEF4053 [7550]
The front end (AFV) audio is applied to pin 12 of 7550 and the added signal (L+R, AIN1) of Scart 1 is applied to pin 13. The changeover line DEC pin 11 [7550] is provided by the STV6400 [7552] via pin 5.

The logic is transferred to the STV6400 [7552] by the control µP via the IIC-Bus. The output of this switch AOUT2 pin 14 {7550] moves to Scart 2 (decoder socket E2). A downstream emitter follower decouples at low-resistance (interference).

b) Monitor switch 1/3 HEF4053 [7550]
The audio signal of the linear audio part (AMLP) is applied to pin 5 of [7550], at pin 3 the added signal (L+R, AIN1) of Scart 2 is applied. The changeover line MON pin 9 [7550] is provided by the STV6400 [7552] via pin 13.
The logic is transferred to the STV6400 [7552] by the control µP via the IIC-Bus. The output of this switch AOUT1 pin 4 [7550] moves to Scart 1 (monitor socket E1). A downstream emitter follower decouples at low-resistance (interference).

c) Linear audio input switch
The audio signal of Scart 1 (AIN1) is applied to pin 2 of [7550], at pin 1 the added signal (AIN2) of Scart 2 is applied. The changeover line IS2 pin 10 [7550] is controlled by a control µP via the IIC-bus to the ST6400 [7552] which provides this line via pin 7. The output of this switch pin 15 [7550] passes to a further 1/3 HEF4053 [7551] pin 3 and the audio front end signal (AFV) at pin 5. The switching line IS1 pin 9 [7550] is controlled by deck µP pin 38 [7410] which provides this line via pin 9 [7551]. The output of this switch AMLR pin 4 [7551] passes to the linear audio.

VPS :

The VPS IC SDA5642 [7540] reads the data supplied by the transmitter from line 16 and passes the data required for the timer start to the control µP. Also data like station names are passed to the µP.

PDC/VPS : (for PAL-I sets with auto install only)

The PDC IC SDA5649 [7540] reads out the data supplied by the station in the vertical blanking gap. This data is separated into two formats:
PDC format 2 - this contains relevant programming help data, and
PDC format 1 - this contains the station names.
This IC can also evaluate the VPS data.

IN/OUT - OIO - VS part

Secam L

Recording:

The FBAS signal (VBS) passes from the I/O part via the soldered connection [1952] (pin 5) and the emitter follower [7101] to the bell filter (cloche) reversing the station Rf-pre-emphasis. In the Secam L IC pin 29 [7151] the signal passes through a 15 dB amplifier and limiter with downstream frequency divider via pins 24 and 25.
This frequency divider generates through frequency division (1:4) of the chrominance signal the 1.1 MHz signal required for recording which is applied to pin 21 with the downstream band pass filter. The band pass filter attenuates the harmonics created by the frequency division. Simultaneously the chrominace signal is read out at this stage during the line synchronous pulse. It then passes through a 10 dB amplifier and is applied to pin 15 to an anti-cloche filter. The filter in turn generates the FM-pre-emphasis which is standard specification for a Secam chrominace signal. This is then passed as a CSR signal to the signal electronic part, where it is added to the Y signal.

Control of record/playback
The switch between record and playback is effected by the 5VPB voltage. In case this voltage is missing, the CB diode of transistor 7105 (collector 0V) becomes conductive, moving the voltage of pin 23 to 1.3 V, so that the IC switches from playback to record.

Playback:

During playback the FM signal (FMPV) is passed to pin 23, amplified by 6dB, passed via the same band pass filter as during recording and is once again amplified by 10dB. Downstream of pin 15 the RF-pre-emphasis of the recording is reversed, the anti-cloche circuit operating in this case as cloche circuit, as the filter is in the feedback branch of a further amplifier in IC [7151]. In the subsequent stages the signal is controlled (AGC) and its frequency is doubled (rectifier). The band pass filter on pin 10 cleans the signal of interfering harmonics before it is once more doubled in frequency. For the signal to become a standard Secam chrominance signal it is reequipped with a RF-pre-emphasis (anti-cloche). The chrominance signal finally passes through a colour killer stage, a band pass filter and an emitter follower, before being applied as a CSP signal to pin 28 of the signal electronic IC [7051].

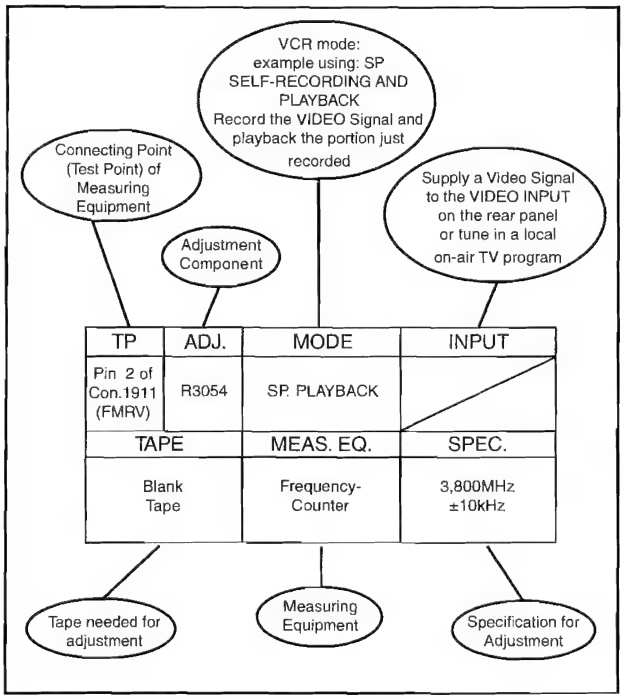
Remarks:

Electrical Adjustment Instructions

Test equipment:

1. Dual-trace oscilloscope
   Voltage range : 0.001 ~ 50 V/div
   Frequency : DC ~ 50 MHz
   Probe : 10:1, 1:1
2. DVM (Digital Voltmeter)
3. Frequency counter
4. Sinus generator
   Sinus : 0 ~ 50 MHz
5. Test pattern generator
6. VHS Alignment Tape 4822 397 30103

How to read the adjustment procedures:



Video signal processing - OFB

1. Sync level frequency (3054) :

Purpose: To maintain the recording interchangeability by adjusting the sync frequency and deviation.

Symptom, if incorrectly set:
Record interchangeability is inadequate.

TP	ADJ.	MODE	INPUT
Pin 2 of Con.1911 (FMRV)	R3054	Record Preset E1	No input signal
TAPE		MEAS. EQ.	SPEC.
Blank Tape		Frequency-Counter	3,800MHz ±10kHz

2. Chrominance record current adjustment :

Purpose: To set the optimum record chrominance level.

Symptom, if incorrectly set:
If the record level is too high, beats may be seen in the picture.
If the level is too low, the colour may be degraded.

2.1 PAL Chrominance record current adjustment (3038)

Before commencing adjustment, connect Pin 2 of IC7051 to Pin 13 (+5V).

TP	ADJ.	MODE	INPUT
Pin 2 of Con.1911 (FMRV)	R3038	Record of Preset E1	(VIDEO IN E1) Red Picture 75% Saturation
TAPE		MEAS. EQ.	SPEC.
Blank Tape		Oscilloscope Video Pattern Generator	X=71mV$_{pp}$ (-12,5dB relative to the luminance signal) see Fig.1

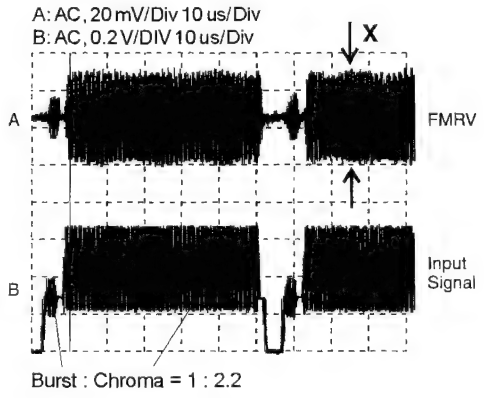


Fig. 1

2.2 SECAM Chrominance record current adjustment (3042)

Before commencing adjustment, connect Pin 2 of IC7051 to Pin 13 (+5V).

TP	ADJ.	MODE	INPUT
Pin 2 of Con.1911 (FMRV)	R3042	Record of Preset E1	(VIDEO IN E1) Red Picture SECAM 75% Saturation
TAPE		MEAS. EQ.	SPEC.
Blank Tape		Oscilloscope Video Pattern Generator	X=42mV$_{pp}$ (-17dB relative to the luminance signal) see Fig. 1

Front End - OFB

1. AFC - Adjustment :

Purpose: Correct adjustment of demodulator AFC - circuit.

Symptom, if incorrectly set:
Bad or disturbed TV channel reception.

1.1 PAL - AFC - Tuning (5770) :

TP	ADJ.	MODE	INPUT
IC 7772 Pin 10	L5770	E to E	38,9MHz 100mV$_{pp}$ at Tuner 1701 Pin 17
TAPE		MEAS. EQ.	SPEC.
		DC Voltmeter Frequ. Generator	2,5V ±0,2V

1.2 PAL/SECAM - AFC - Tuning (5725) :

TP	ADJ.	MODE	INPUT
IC 7701 Pin 20	L5725	E to E	38,9MHz 100mV$_{pp}$ at Tuner 1701 Pin 17
TAPE		MEAS. EQ.	SPEC.
		DC Voltmeter Frequ. Generator	2,5V ±0,2V

1.3 SECAM Bd.1 - AFC - Tuning (3748) :

Before commencing adjustment:

- Connect pin 1 of connector 1912 (PSS) to ground (SECAM active)
- Connect collector of 7723 to ground (Band 1 active) .

TP	ADJ.	MODE	INPUT
IC 7701 Pin 20	R3748	E to E	33,9MHz 100mV$_{pp}$ at Tuner 1701 Pin 17
TAPE		MEAS. EQ.	SPEC.
		DC Voltmeter Freq. Generator	2,5V ±0,2V

2. HF - AGC Adjustment :

Purpose: Set amplifier control.

Symptom, if incorrectly set:
AGC synchronises incorrectly if input level is too low and causes picture distortion if input level is too high.

2.1 HF - AGC Adjustment PAL (3770) :

TP	ADJ.	MODE	INPUT
Tuner 1701 Pin 17	R3770	Set tuned to channel 24	2,2mV(67dBµV) on aerial input PAL white picture, audio IF on, no modulation
TAPE		MEAS. EQ.	SPEC.
		Oscilloscope Video Pattern Generator	550mV$_{pp}$ +0/-50mV (use a 10:1 probe)

2.2 HF - AGC Adjustment PAL/SECAM (3742) :

TP	ADJ.	MODE	INPUT
Tuner 1701 Pin 17	R3742	Set tuned to channel 24	2,2mV(67dBµV) on aerial input PAL white picture, audio IF on, no modulation
TAPE		MEAS. EQ.	SPEC.
		Oscilloscope Video Pattern Generator	550mV$_{pp}$ +0/-50mV (use a 10:1 probe)

Audio linear - OFB

1. Adjustment of erasing frequency (5603) :

Purpose: To set the correct recording erasing frequency.

Symptom, if incorrectly set:
Erasing frequency or its harmonics cause audio faults.

TP	ADJ.	MODE	INPUT
Pin 7 of Con. 1918 (ARH)	L5603	Record	
TAPE		MEAS. EQ.	SPEC.
Blank Tape		Frequency Counter	70kHz ±10kHz

2. Adjustment of bias current (3618) :

Purpose: Set optimum record bias current.

Symptom, if incorrectly set:
If audio bias level is too high, the frequency response deteriorates.
If the level is too low, sound distortion may occur.

TP	ADJ.	MODE	INPUT
R3600 (difference measurement)	R3618	Record	
TAPE		MEAS. EQ.	SPEC.
Blank Tape		AC Millivolmeter	15mV$_{RMS}$ (70kHz)

Control of 'bias' adjustment :

After the bias has been adjusted to the indicated level, make a music recording and then play this recording back. Check if sufficient treble is reproduced or if any audio distortion is present. In case of insufficient treble, reduce 'bias' current a little. In case of excessive distortion, increase 'bias' current a little.
Use brand name cassettes but no chrome dioxide tapes.

3. Adjustment of playback amplitude (3606) :

Purpose: Set audio part amplification.

Symptom, if incorrectly set:
Playback sounds too faint or too loud.

TP	ADJ.	MODE	INPUT
Pin 1 of Scart 1 (Audout)	R3606	SP Self-recording and Playback	(AUDIO IN E1) 700mV$_{RMS}$ 1kHz
TAPE		MEAS. EQ.	SPEC.
Blank Tape		AC Millivoltmeter	500mV$_{RMS}$ ±50mV

Deck electronics - OFB

1. Software adjustment of gap positions:

Purpose: Determination of head switching pulse during playback.

Symptom, if incorrectly set:
Head switching faults and/or vertical image flickering.

TP	ADJ.	MODE	INPUT
		SP Playback	
TAPE		MEAS. EQ.	SPEC.
VHS Alignment Tape 4822 397 30103			refer to description below

- Insert test cassette with standard video signal (eg.: 4822 397 30103).
- Call up service mode (press STOP on remote control and PLAY on the set simultaneously for approx. 5 sec.).
- Simultaneously press PLAY on remote control and EJECT on the set.

This triggers the automatic adjustment and the set values are stored in the EEPROM.
After successful tuning the VCR switches to STAND BY.

In case of unsuccessful tuning the VCR ejects the cassette.

Causes : Standard video signal incorrect.
Scanner faulty.
Microprocessor faulty.

Power supply- NSM

Adjustment of output voltage +5V :

Purpose: To obtain correct operation.

Symptom, if incorrectly set:
Incorrect VCR functioning.

TP	ADJ.	MODE	INPUT
Pin 9 of Con. 1509 (+5A)	R3204	Playback	
TAPE		MEAS. EQ.	SPEC.
Any tape		DC Voltmeter	5,4V ±0,03V

Operating panel - ODC

1. Timer frequency adjustment (2005) :

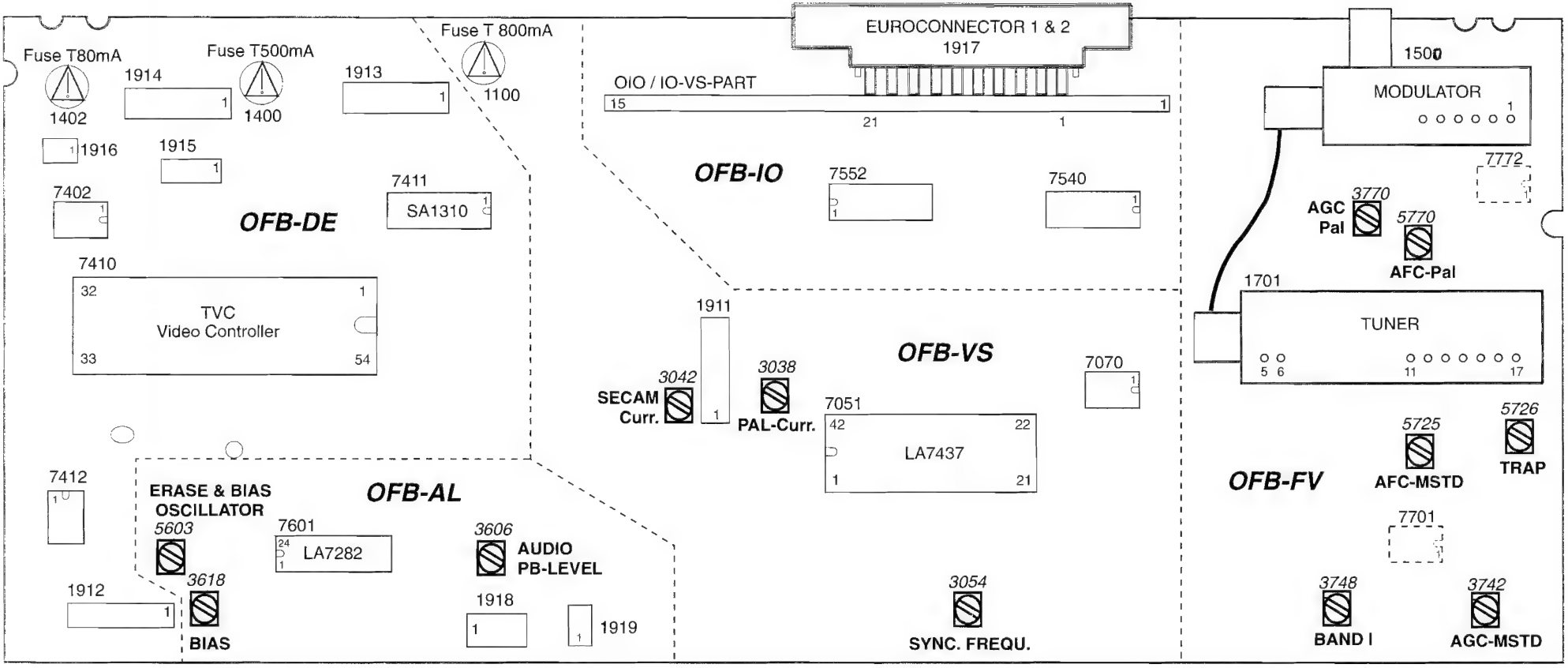
Purpose: Adjustment for the exact clock running.

Symptom, if incorrectly set:
The clock runs too fast or too slow.

Before adjustment:

- Disconnect the set from the mains.
- Connect pin 67 and 68 of IC7101 to pin 33 (+5V).
- Reconnect the set to the mains.

TP	ADJ.	MODE	INPUT
Pin 1 of Con. 1101 (PWM)	C2005	E to E	
TAPE		MEAS. EQ.	SPEC.
		Frequency Counter	488,28125µsec ±0,715nsec


Fuse T80mA
1402
Fuse T500mA
1400
1914
1913
Fuse T 800mA
1100
EUROCONNECTOR 1 & 2
1917
OIO / IO-VS-PART
15
21
1
1500
MODULATOR
1916
1915
OFB-IO
7552
7540
7772
AGC
Pal
3770
5770
AFC-Pal
7402
OFB-DE
7411
SA1310
1701
7410
TVC
Video Controller
32
33
54
TUNER
5 6
11
17
1911
OFB-VS
7070
3042
SECAM
Curr.
3038
PAL-Curr.
7051
LA7437
42
22
21
5725
AFC-MSTD
5726
TRAP
7412
ERASE & BIAS
OSCILLATOR
OFB-AL
OFB-FV
5603
7601
LA7282
24
3606
AUDIO
PB-LEVEL
7701
1912
3618
BIAS
1918
1919
3054
SYNC. FREQU.
3748
BAND I
3742
AGC-MSTD

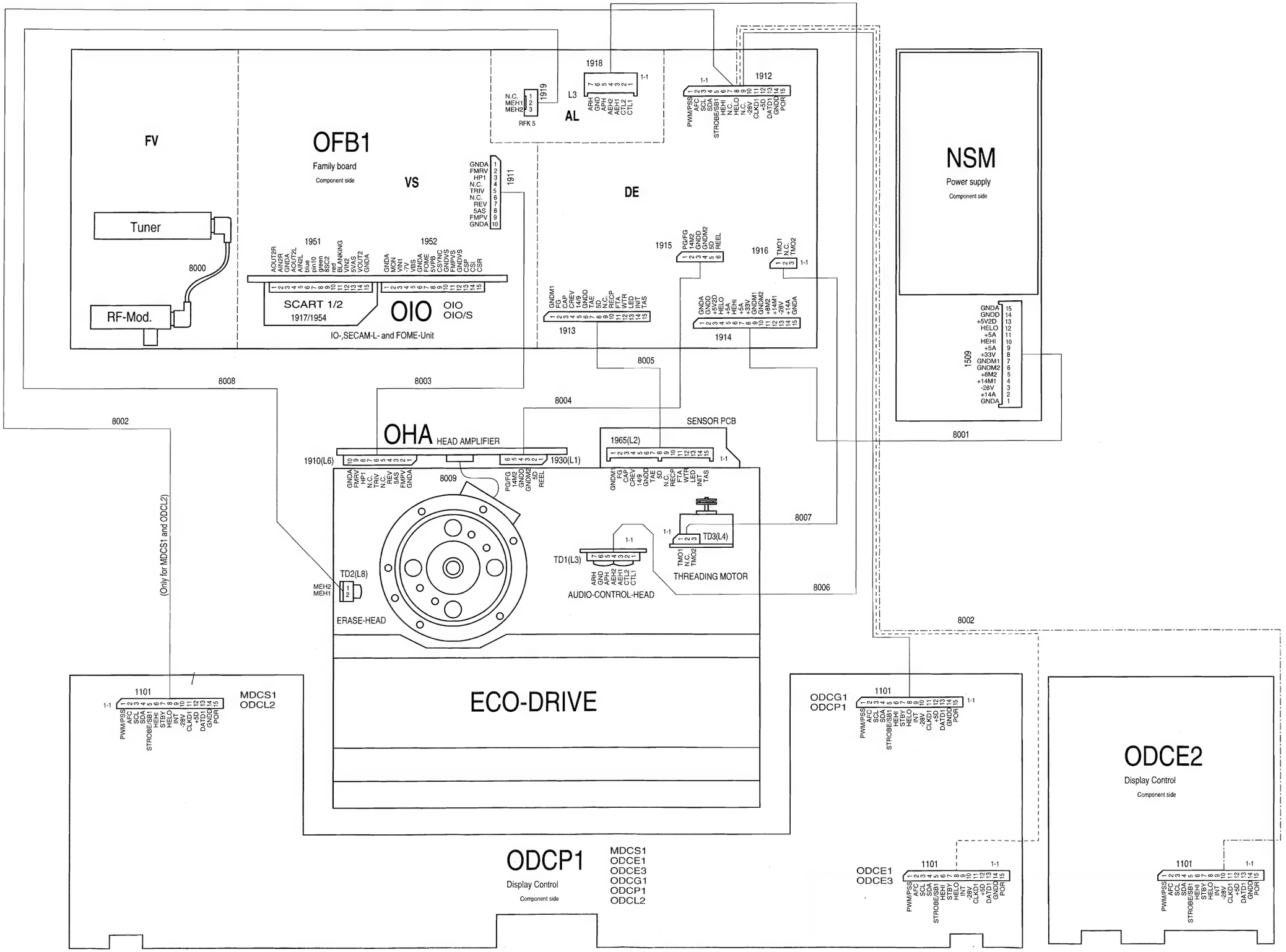
List of abbreviations

Signal	Description	Application								
+12A	+12V analog	DE	IO		AL	FV				
+14A	+14V analog	DE					PS			
+14M1	+14V for capstan-, threading- and headmotor	DE					PS		HV	
+33V	+33V for tuner tuning voltage	DE				FV	PS			
+5A	+5V analog from power supply	DE					PS			
+5D	+5V digital after fuse 1400	DE						DC	HV	
+5V2D	+5V digital from power supply	DE					PS			
+8M2	+8,2V motor supply (not used)	DE					PS			
-28V	-28V display supply	DE	IO							
-7V	-7V I/O-switches supply		IO					DC		
10SC	Pin 10 scart 1 (not used)	DE								OIO
5VA	+5V analog	DE		VS		FV				
5VAS	+5V analog, after fuse 1100		IO	VS		FV			HV	OIO
5VPB	+5V playback		IO	VS						OIO
5VSE	+5V analog, after fuse and coil			VS						
8SC1	Scart 1 pin 8	DE	IO							
8SC2	Scart 2 pin 8	DE	IO							OIO
AEH1/2	Audio erase head				AL					
AFC	Automatic frequency control	DE				FV		DC		
AFV	Audio from frontend		IO			FV				
AGC	Automatic gain control	DE				FV				
AIN1	Audio input scart 1		IO			FV				
AIN2	Audio input scart 2		IO							
AIN2L	Audio input from scart 2		IO							OIO
AMLP	Audio mono playback		IO		AL					
AMLR	Audio mono record		IO		AL					
AOTDA	Audio output TDA 5950		IO			FV				
AOUT1	Audio output from scart 1		IO							
AOUT2	Audio output from scart 2		IO							
AOUT2L	Audio output from scart 2		IO							OIO
APH	Audio playback head				AL					
ARH	Audio record head				AL					
BLANKING	Blanking pulse RGB loopthrough		IO							OIO
BLUE	Blue signal between scart 1/2		IO							OIO
CAP	Capstan control voltage	DE								
CKPAL	Colour killer PAL	DE		VS						
CLKD1	Serial bus clock	DE						DC		
CREV	Capstan reverse	DE								
CROT	Colour rotation on/off	DE		VS						
CSI	Colour system information	DE	IO							OIO
CSP	Chrominance secam playback		IO	VS						OIO
CSR	Chrominance secam record		IO	VS						OIO
CSYNC/1	Composite sync pulse	DE	IO	VS					HV	OIO
CTL1/2	Control track signal	DE			AL					
DATD1	Serial bus data	DE						DC		

DEC	Audio switching voltage		IO							
DO	Drop-out compensation on/off	DE		VS						
ENVC	Envelope comparator signal	DE		VS					HV	
FFP	Feature frame pulse	DE		VS						
FG	Capstan tacho pulse	DE								
FGD	Capstan tacho pulse digital	DE								
FMPV	FM video playback secam			VS					HV	
FMPVS	FM video playback		IO	VS						OIO
FMRV	FM video record			VS					HV	
FMSW	FM band-pass filter switching	DE		VS						
FTA	Threading tacho	DE								
FTAD	Threading tacho digital	DE								
GNDA	Ground analog	DE	IO	VS			PS		HV	OIO
GNDD	Ground digital	DE					PS	DC	HV	
GNDM1	Ground threading- and headmotor	DE					PS		HV	
GNDM2	Ground capstan motor	DE					PS			
GNDVS	Ground signal electronics		IO							
GREEN	Green signal between scart1/2		IO							OIO
HEHI	Heater for displaytube low	DE					PS	DC		
HELO	Heater for displaytube high	DE					PS	DC		
HMO	Head drum motor								HV	
HP1	Head switching pulse	DE		VS					HV	
HSC	Head select control	DE		VS					HV	
HSC2	Colour phase switching for LP feature mode	DE		VS						
I/R	Init- and recordswitch	DE								
IMODON	Inverse modulator on/off	DE	IO							
INIT	Deck switch	DE								
INTSC	Inverse NTSC-playback	DE		VS						
IPAL	Inverse playback audio linear	DE			AL					
IPB	Inverse playback	DE								
IPBV	Inverse playback video	DE	IO			FV				
IPOR	Inverse power on reset	DE								
IRAL	Inverse record audio linear	DE			AL					
IREV	Inverse record video	DE		VS						
IS1	Input select 1	DE	IO			FV				
IS2	Input select 2		IO							
ITRICK	Comb filter by-pass during feature mode	DE		VS						
IWIND	8V/14V switching for capstan motor	DE								
LED	LED-tower supply	DE								
LP	Longplay on/off	DE		VS						
LPA	Longplay audio	DE			AL					
MEH1/2	Main erase head				AL					
MES	Middle East secam	DE		VS						
MON	Monitor loop through scart 1/2		IO							OIO
MTA	Audio mute	DE			AL					
NC	Not connected	DE								
PG/FG	Head wheel position/-speed	DE							HV	
POR	Power on reset	DE						DC		

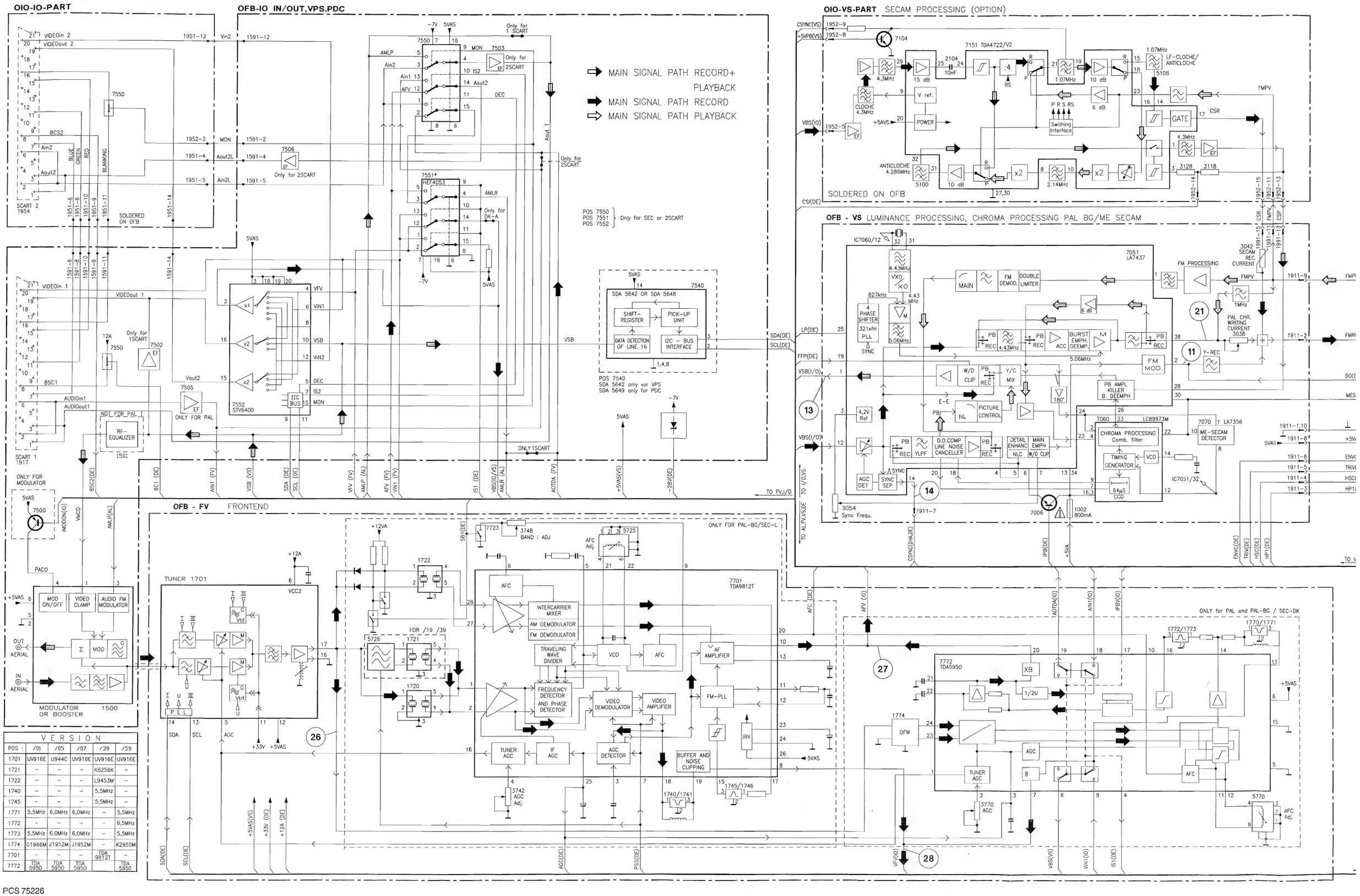
POS	Position pulse headwheel								HV	
PSS	PAL or secam-L	DE				FV		DC		
RALM	Record audio linear + mute	DE			AL					
RECP	Record protection	DE								
RED	Red signal between scart1/2		IO							OIO
REEL	Head wheel control	DE							HV	
REV	Record video								HV	
SB1	Secam band 1	DE				FV		DC		
SCL	IIC bus clock	DE				FV		DC		
SDA	IIC bus data	DE				FV		DC		
SYNC	Control track pulse	DE								
TAE	Tape end detection	DE								
TAS	Tape start detection	DE								
THIO	Threading motor in/out	DE								
TMO	Threading motor on/off	DE								
TMO1/2	Threading motor connection	DE								
TRIV	Tracking information video	DE		VS					HV	
VBS	Video to signal electronics		IO	VS		FV				OIO
VFV	Video from frontend		IO			FV				
VH1/2	Video heads								HV	
VIN1	Video input scart 1		IO			FV				OIO
VIN2	Video input scart 2		IO							OIO
VISS	Control sync pulse inversion	DE								
VOUT1	Video output scart 1		IO							
VOUT2	Video output scart 2		IO							OIO
VSB	Video from signal electronics		IO	VS						
W/R	Control track write/read	DE								
WTL	Wind tacho left	DE								
WTR	Wind tacho right	DE								
WTRD	Wind tacho right digital	DE								

Wiring Diagram



3-2

Block Diagram Analog Part Olivia Eco



VERSION					
POS :	/01	/05	/07	/39	/59
1701	UV916E	U944C	UV916E	UV916E	UV916E
1721	–	–	–	K6256K	–
1722	–	–	–	L9453M	–
1740	–	–	–	5,5MHz	–
1745	–	–	–	5,5MHz	–
1771	5,5MHz	6,0MHz	6,0MHz	–	5,5MHz
1772	–	–	–	–	6,5MHz
1773	5,5MHz	6,0MHz	6,0MHz	–	5,5MHz
1774	G1966M	J1952M	J1952M	–	K2955M
7701	–	–	–	TDA 9812T	–
7772	TDA 5950	TDA 5950	TDA 5950		TDA 5950

MAIN SIGNAL PATH RECORD+ PLAYBACK
MAIN SIGNAL PATH RECORD
MAIN SIGNAL PATH PLAYBACK

7550 / 7551 / 7552 } Only for SEC or 2SCART

OIO-VS-PART SECAM PROCESSING (OPTION)

OFB - VS LUMINANCE PROCESSING, CHROMA PROCESSING PAL BG/ME SECAM

OHA HEAD AMPLIFIER

OFB - AL AUDIO LINEAR

ONLY FOR PAL-BG/SEC-L

ONLY for PAL and PAL-BG / SEC-DK

SOLDERED ON OFB

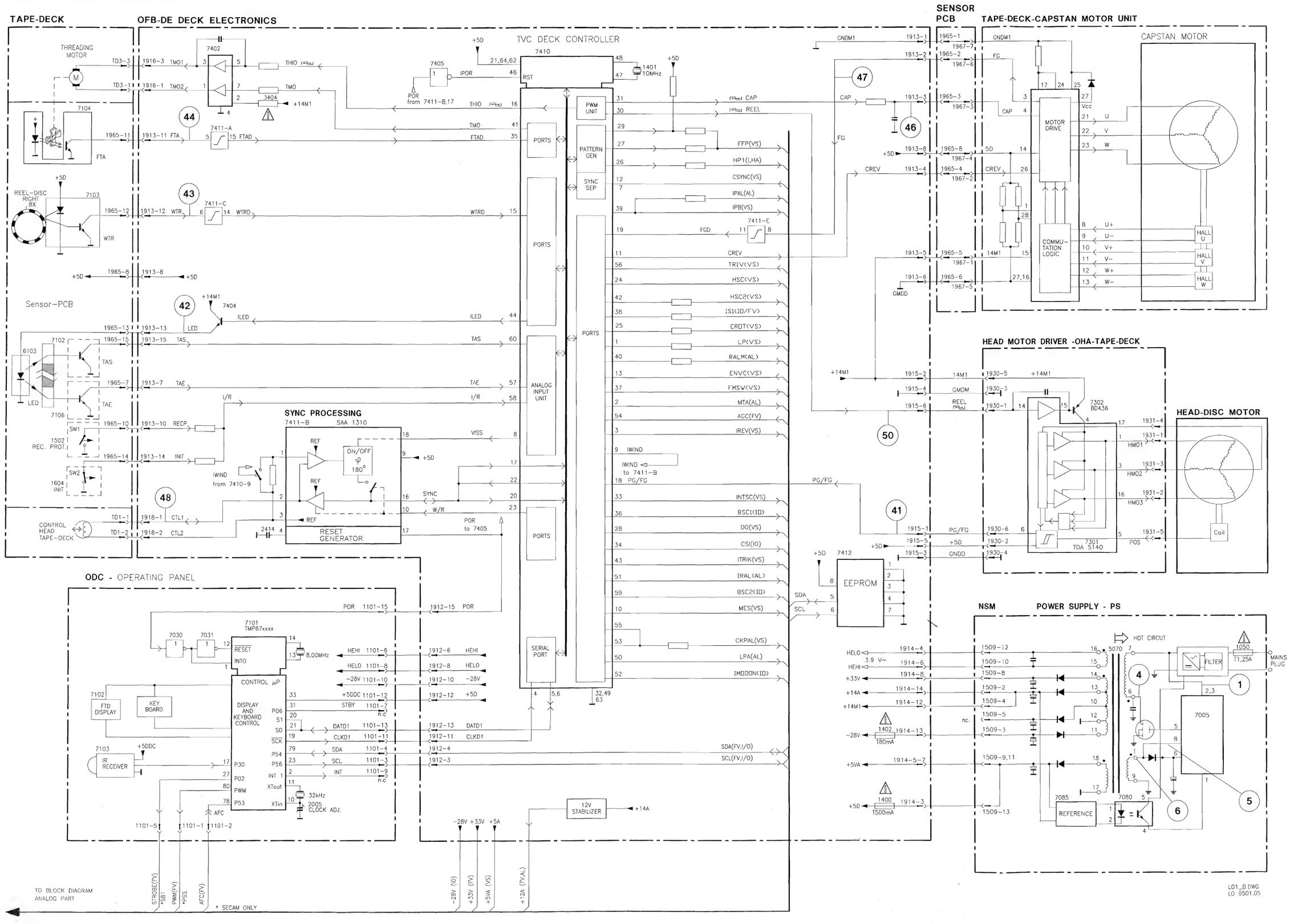
ROTATING TRANSFORMER

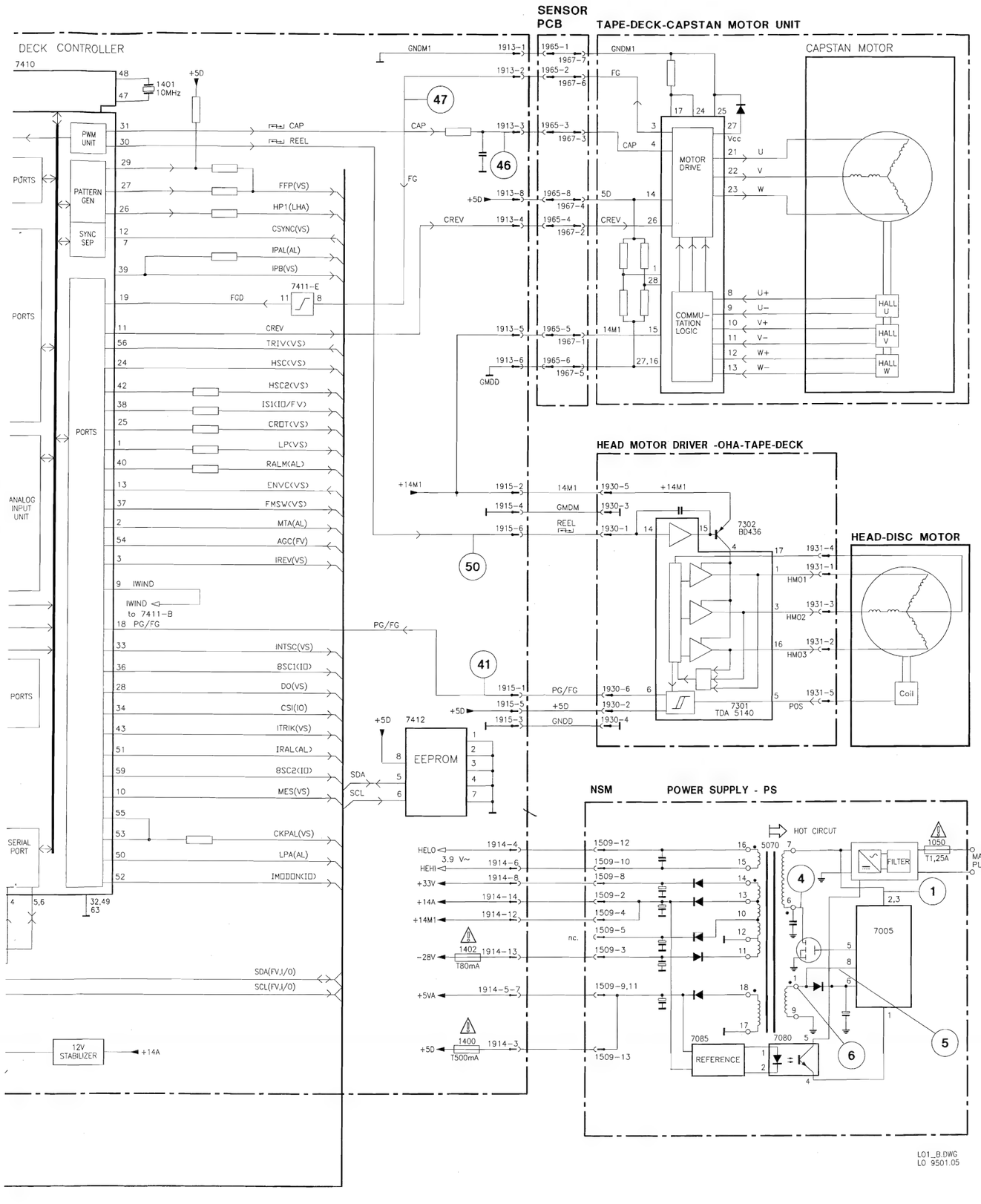
TO FV,I/O
TO I/O,VS
TO AL,FV,VS,DE
TO VS,FV,I/O
TO VS,OHA
TO AL,DE,FV
TO FV
TO OHA,AL,FV,VS,I/O
TO BLOCK DIAGRAM DECK ELECTRONICS POWER SUPPLY OPERATING PANEL

LO1_A.DWG 9501.02

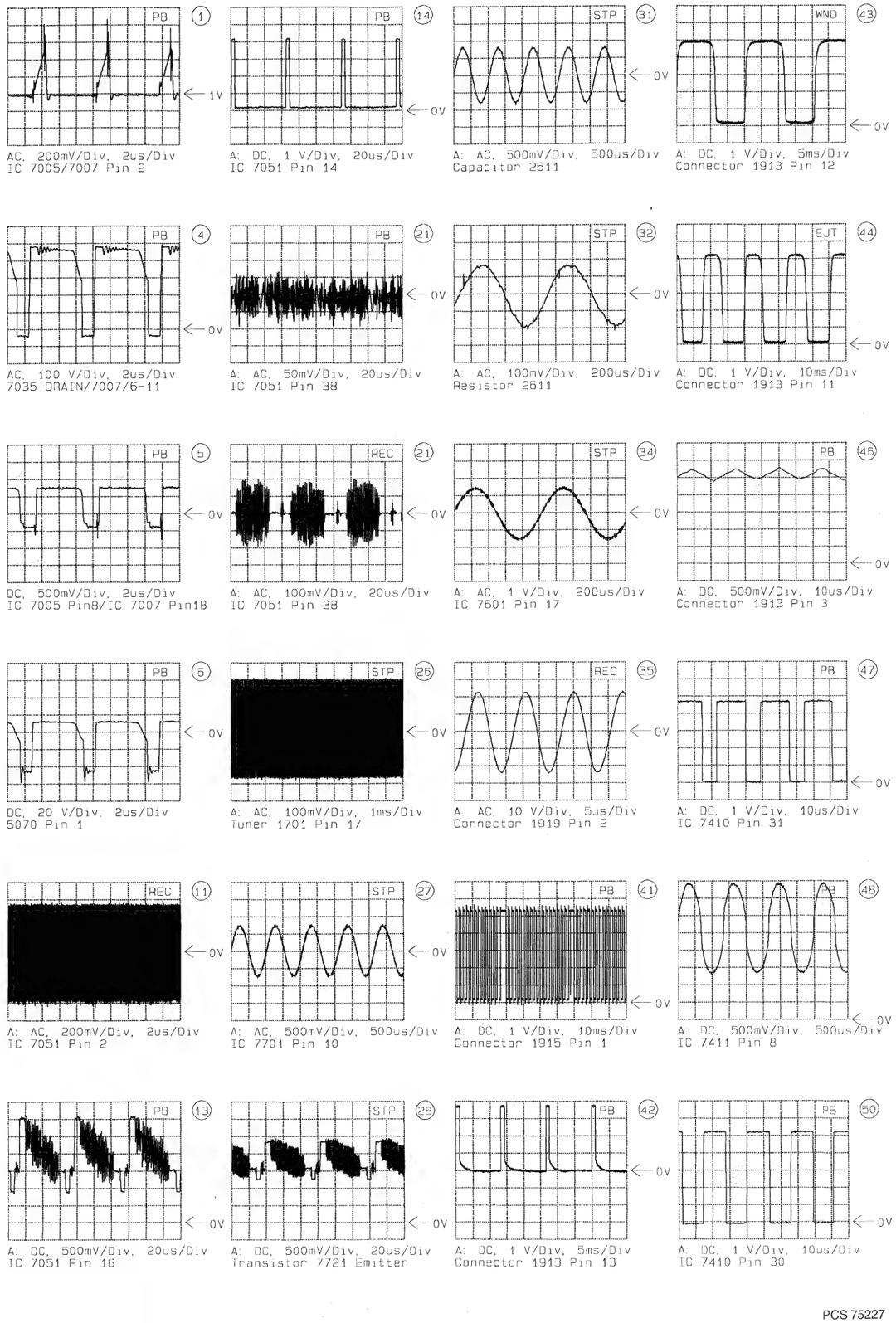
POS 7540
SDA 5642 only vor VPS
SDA 5649 only for PDC

Block Diagram Digital Part Olivia Eco

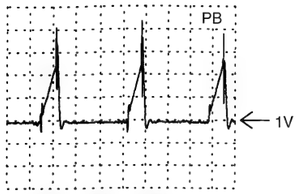




Oscillograms Block Diagram

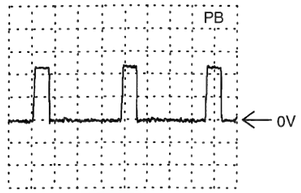


Power Supply NSM1 (PS)



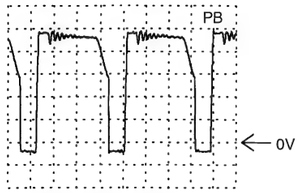
AC, 200mV/Div, 2us/Div
IC 7005/7007 Pin 2

(1)



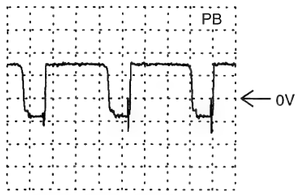
DC, 5 V/Div, 2us/Div
IC 7005 Pin 5/IC 7007 Pin 14,15

(2)



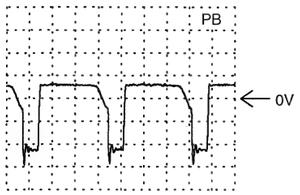
AC, 100 V/Div, 2us/Div
T 7035 DRAIN/IC 7007 Pin 6-11

(4)



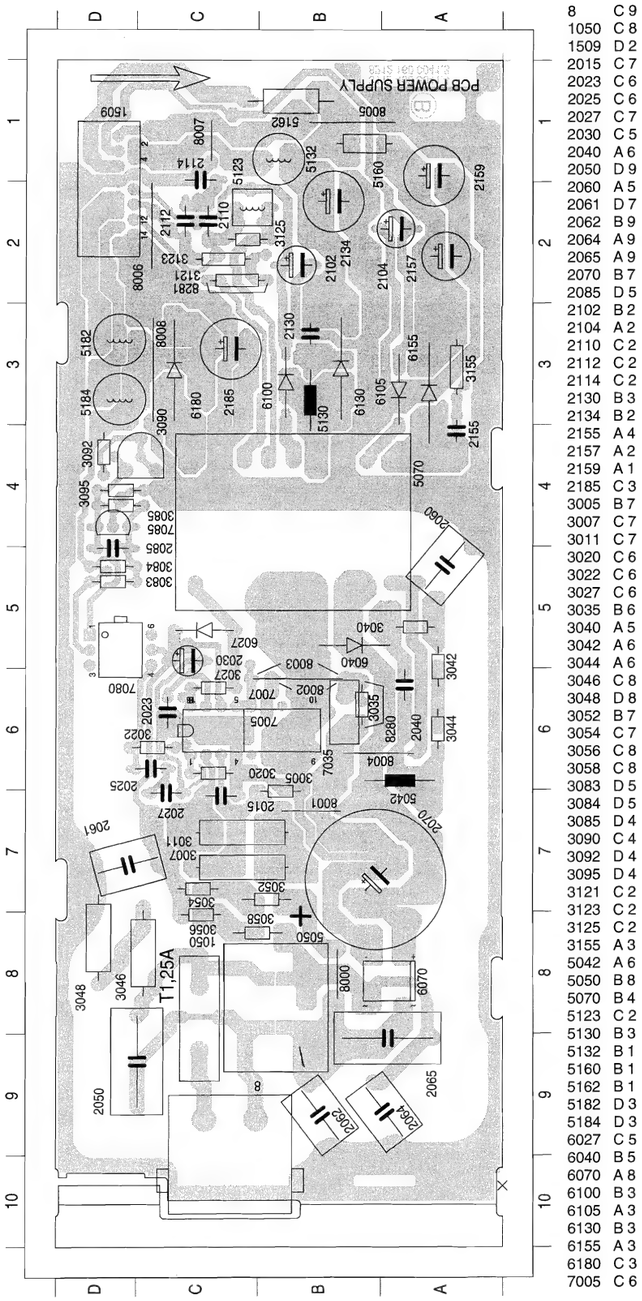
DC, 500mV/Div, 2us/Div
IC 7005 Pin8/IC 7007 Pin18

(5)

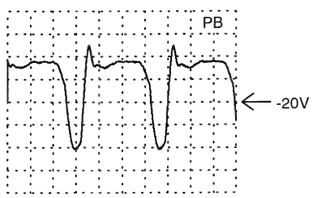


DC, 20 V/Div, 2us/Div
5070 Pin 1

(6)

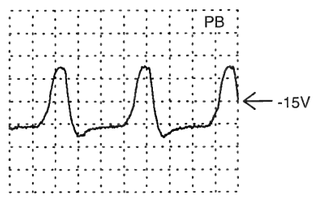


8	C 9	7007	C 6	3121	C 2
1050	C 8	7035	B 6	3123	C 2
1509	D 2	7080	D 5	3125	C 2
2015	C 7	7085	D 4	3155	A 3
2023	C 6	8000	B 8	5042	A 6
2025	C 6	8001	B 7	5050	B 8
2027	C 7	8002	B 6	5070	B 4
2030	C 5	8003	B 6	5123	C 2
2040	A 6	8004	B 6	5130	B 3
2050	D 9	8005	B 1	5132	B 1
2060	A 5	8006	C 2	5160	B 1
2061	D 7	8007	C 1	5162	B 1
2062	B 9	8008	C 3	5182	D 3
2064	A 9			5184	D 3
2065	A 9			6027	C 5
2070	B 7			6040	B 5
2085	D 5			6070	A 8
2102	B 2			6100	B 3
2104	A 2			6105	A 3
2110	C 2			6130	B 3
2112	C 2			6155	A 3
2114	C 2			6180	C 3
2130	B 3			7005	C 6
2134	B 2				
2155	A 4				
2157	A 2				
2159	A 1				
2185	C 3				
3005	B 7				
3007	C 7				
3011	C 7				
3020	C 6				
3022	C 6				
3027	C 6				
3035	B 6				
3040	A 5				
3042	A 6				
3044	A 6				
3046	C 8				
3048	D 8				
3052	B 7				
3054	C 7				
3056	C 8				
3058	C 8				
3083	D 5				
3084	D 5				
3085	D 4				
3090	C 4				
3092	D 4				
3095	D 4				



AC, 2 V/Div, 2us/Div
Connector 1509 Pin 12 (HELO)

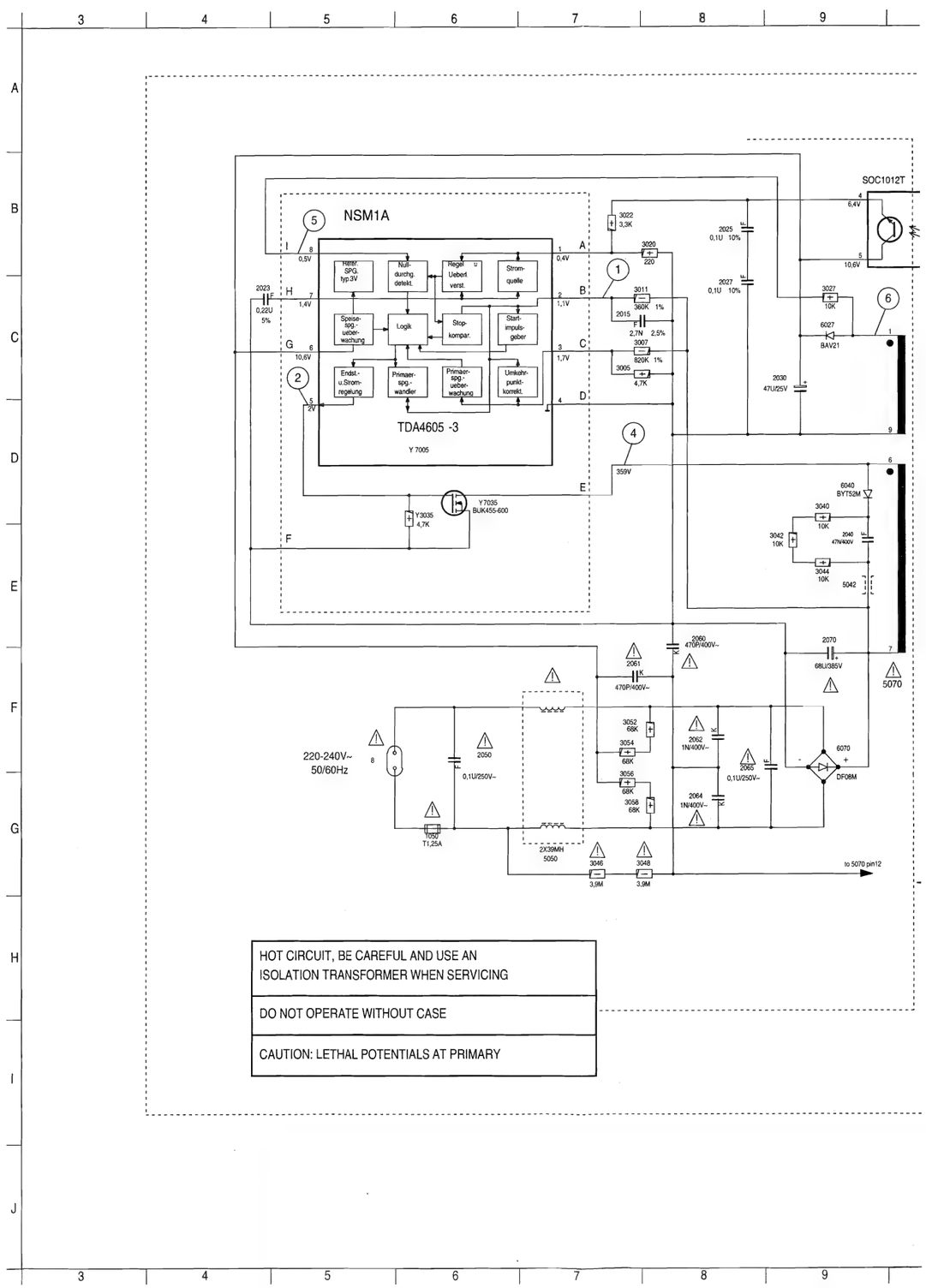
(7)



AC, 5 V/Div, 2us/Div
Connector 1509 Pin 10 (HEHI)

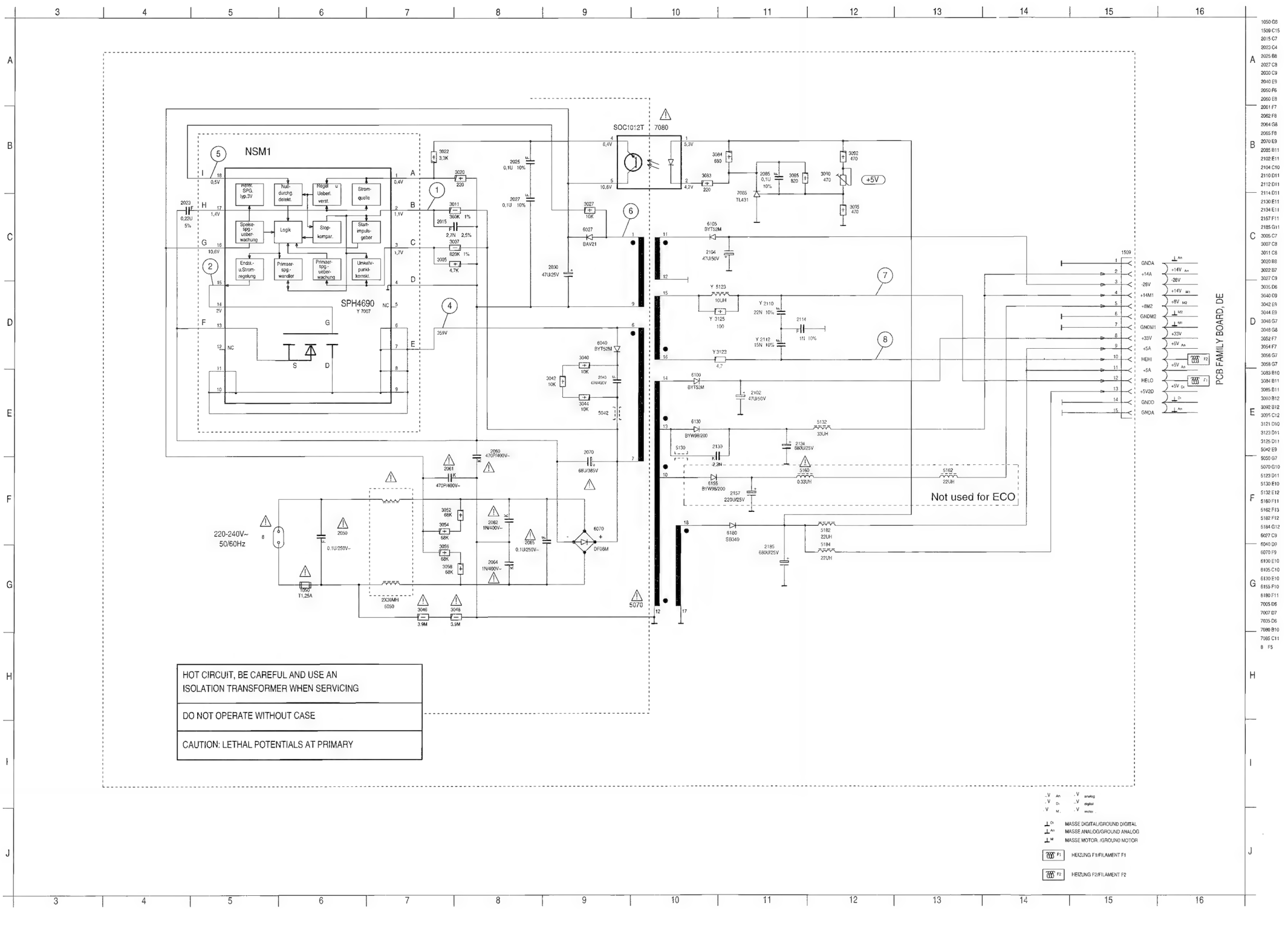
(8)

Power Supply NSM1 (PS)
(Version with TDA4605 IC7005, primary part)



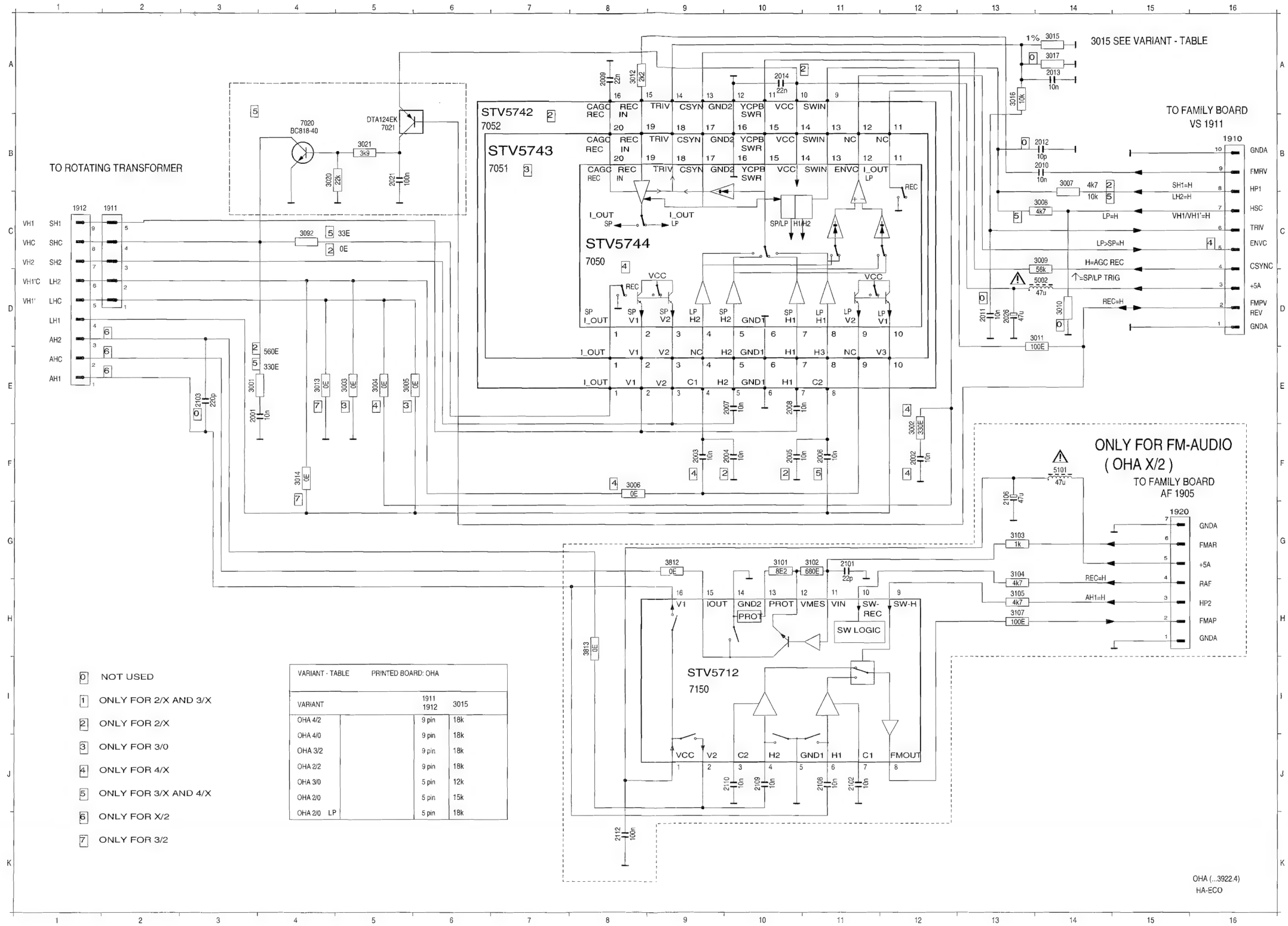
Power Supply NSM1 (PS)

(Version with SPH4690 IC7007)



3-6

Head Amplifier OHA4/2



0 NOT USED

1 ONLY FOR 2/X AND 3/X

2 ONLY FOR 2/X

3 ONLY FOR 3/0

4 ONLY FOR 4/X

5 ONLY FOR 3/X AND 4/X

6 ONLY FOR X/2

7 ONLY FOR 3/2

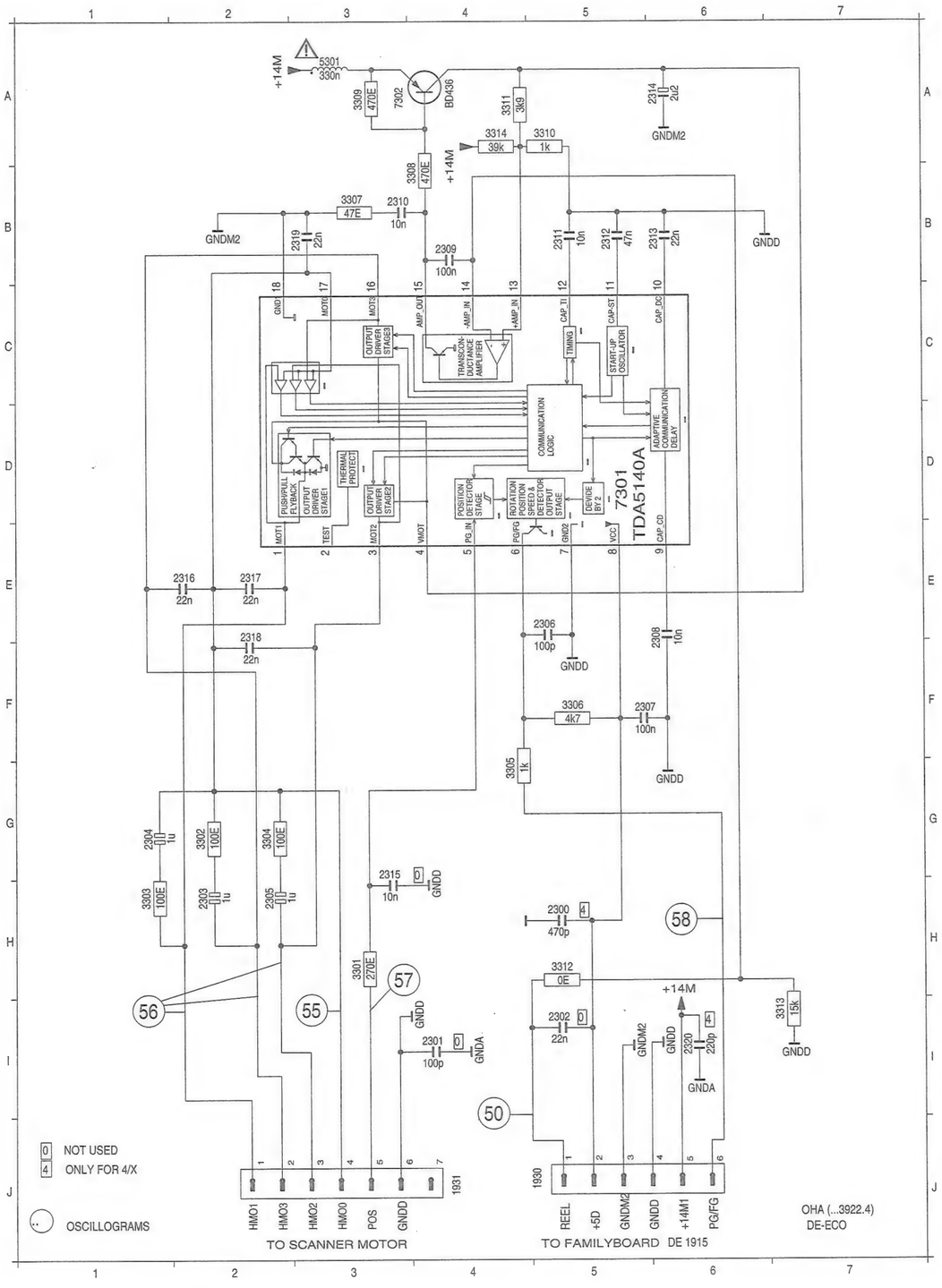
VARIANT - TABLE PRINTED BOARD: OHA

VARIANT	1911 1912	3015
OHA 4/2	9 pin	18k
OHA 4/0	9 pin	18k
OHA 3/2	9 pin	18k
OHA 2/2	9 pin	18k
OHA 3/0	5 pin	12k
OHA 2/0	5 pin	15k
OHA 2/0 LP	5 pin	18k

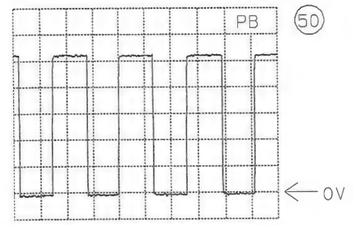
1910 B16
1911 C 2
1912 C 1
1920 G15
2001 E 3
2002 F12
2003 F 9
2004 F10
2005 F10
2006 F11
2007 E10
2008 E10
2009 A 8
2010 B14
2011 D13
2012 B14
2013 A14
2014 A10
2021 B 5
2026 D13
2101 G11
2102 J11
2103 E 3
2106 F13
2108 J11
2109 J10
2110 J10
2112 K 8
3001 E 3
3002 F12
3003 E 5
3004 E 5
3005 E 5
3006 E 8
3007 B14
3008 C14
3009 C14
3010 D14
3011 D14
3012 A 8
3013 E 4
3014 F 4
3015 A14
3016 A13
3017 A14
3020 B 4
3021 B 5
3092 C 4
3101 G10
3102 G11
3103 G13
3104 G13
3105 H13
3107 H13
3812 G 9
3813 H 8
5002 D14
5101 F14
7020 B 4
7021 B 5
7050 C 8
7051 B 6
7052 B 6
7150 I 9

3-7

Head Amplifier OHA4/2 - Deck-Electronics-Part

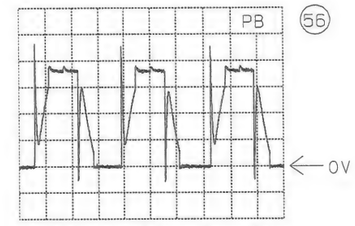


1930 J 4
1931 J 4
2300 H 5
2301 I 4
2302 I 5
2303 H 2
2304 G 1
2305 H 2
2306 E 5
2307 F 5
2308 E 6
2309 B 4
2310 B 3
2311 B 5
2312 B 5
2313 B 6
2314 A 6
2315 G 3
2316 E 2
2317 E 2
2318 E 2
2319 B 3
2320 I 6
3301 H 3
3302 G 2
3303 H 1
3304 G 2
3305 G 4
3306 F 5
3307 B 3
3308 B 4
3309 A 3
3310 A 5
3311 A 4
3312 H 5
3313 I 7
3314 A 4
5301 A 3
7301 D 5
7302 A 3

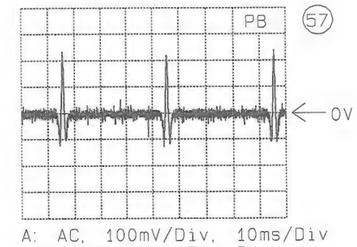


A: DC, 1 V/Div, 10us/Div
IC 7410 Pin 30

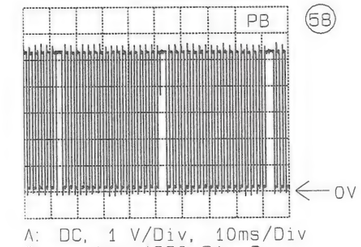
A: DC, 1 V/Div, 500us/Div
1931 Pin 4



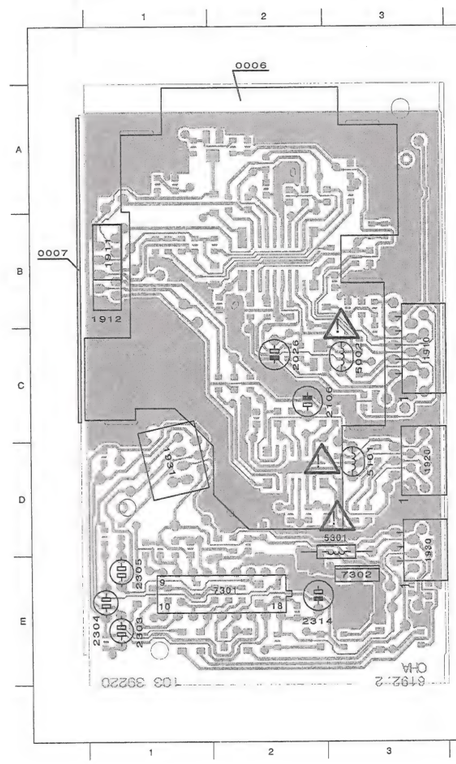
A: DC, 2 V/Div, 2ms/Div
IC 7301 Pin 1, 16, 3



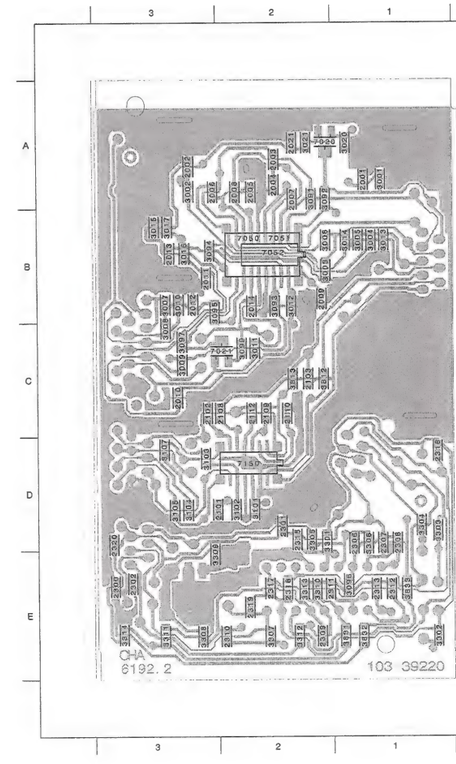
A: AC, 100mV/Div, 10ms/Div
Connetor 1931 Pin 3



A: DC, 1 V/Div, 10ms/Div
Connector 1930 Pin 6



0006 A 2
1910 C 3
1911 B 1
1912 B 1
1920 D 3
1930 D 3
1931 D 1
2026 C 2
2106 C 2
2303 E 1
2304 E 1
2305 E 1
2314 E 2
5002 C 3
5101 D 3
5301 D 3
7301 E 2
7302 E 3

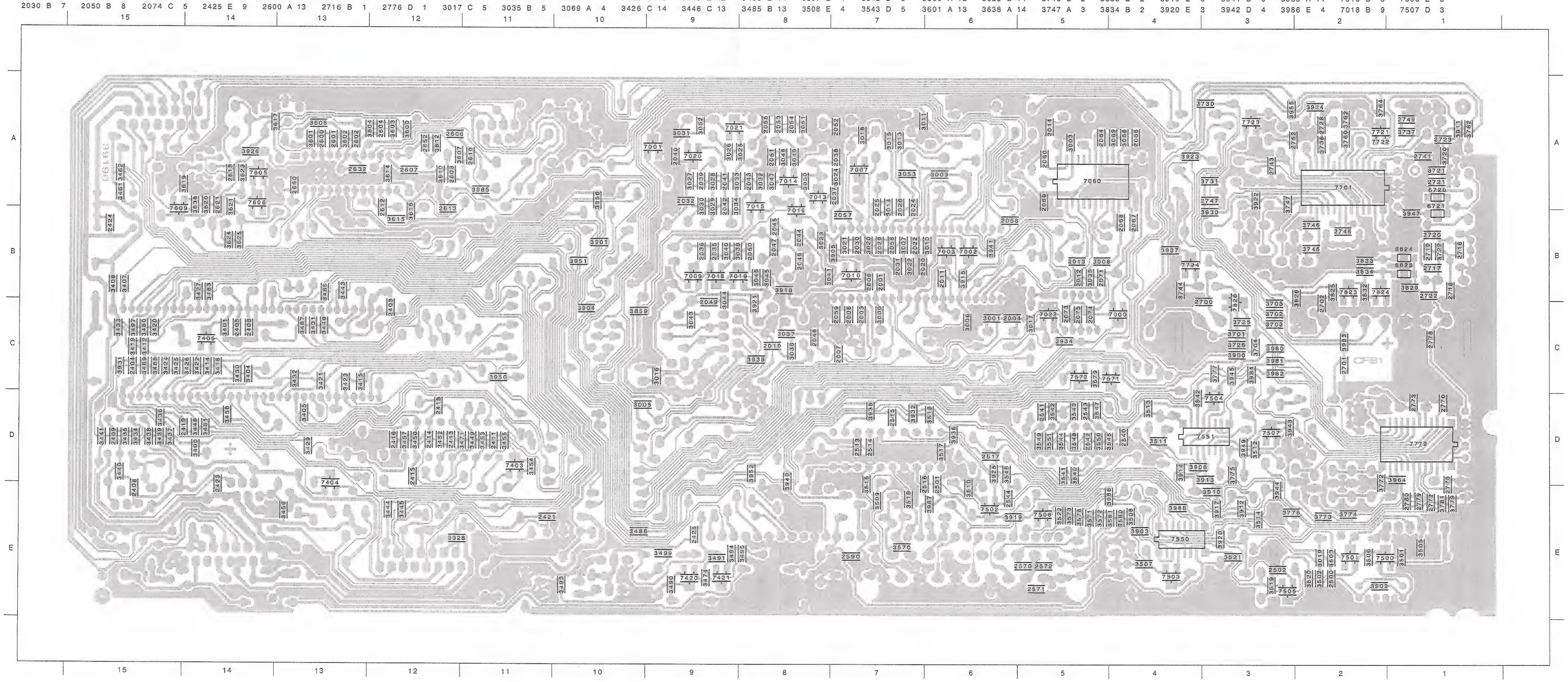


2001 A 1
2002 A 3
2003 A 2
2004 A 2
2005 A 2
2006 A 3
2007 A 2
2008 A 2
2009 B 2
2010 C 3
2011 B 3
2012 B 3
2013 B 3
2014 B 2
2021 A 2
2101 D 3
2102 C 3
2103 C 2
2108 C 2
2109 C 2
2110 C 2
2112 C 2
2300 E 3
2301 D 2
2302 E 3
2306 D 1
2307 D 1
2308 D 1
2309 E 2
2310 E 2
2311 E 2
2312 E 1
2313 E 1
2315 D 2
2316 D 1
2317 E 2
2318 E 2
2319 E 2
2320 D 3
3001 A 1
3002 A 3
3003 B 2
3004 B 1
3005 B 1
3006 B 2
3007 B 3
3008 C 3
3009 C 3
3010 B 3
3011 C 2
3012 B 2
3013 B 1
3014 B 1
3015 B 3
3016 B 3
3017 B 3
3020 A 1
3021 A 2
3091 A 2
3092 A 2
3093 B 2
3094 B 3
3095 B 3
3096 E 1
3097 C 3
3099 C 2
3101 D 2
3102 D 2
3103 D 3
3104 D 3
3105 D 3
3107 D 3
3301 D 2
3302 E 1
3303 D 1
3304 D 1
3305 D 2
3306 D 1
3307 E 2
3308 E 3
3309 E 3
3310 E 2
3311 E 3
3312 E 2
3313 E 2
3314 E 3
3812 C 2
3813 C 2
3831 E 1
3832 E 1
3833 E 1
7020 A 2
7021 C 2
7050 B 2
7051 B 2
7052 B 2
7150 D 2

Family Board OFB

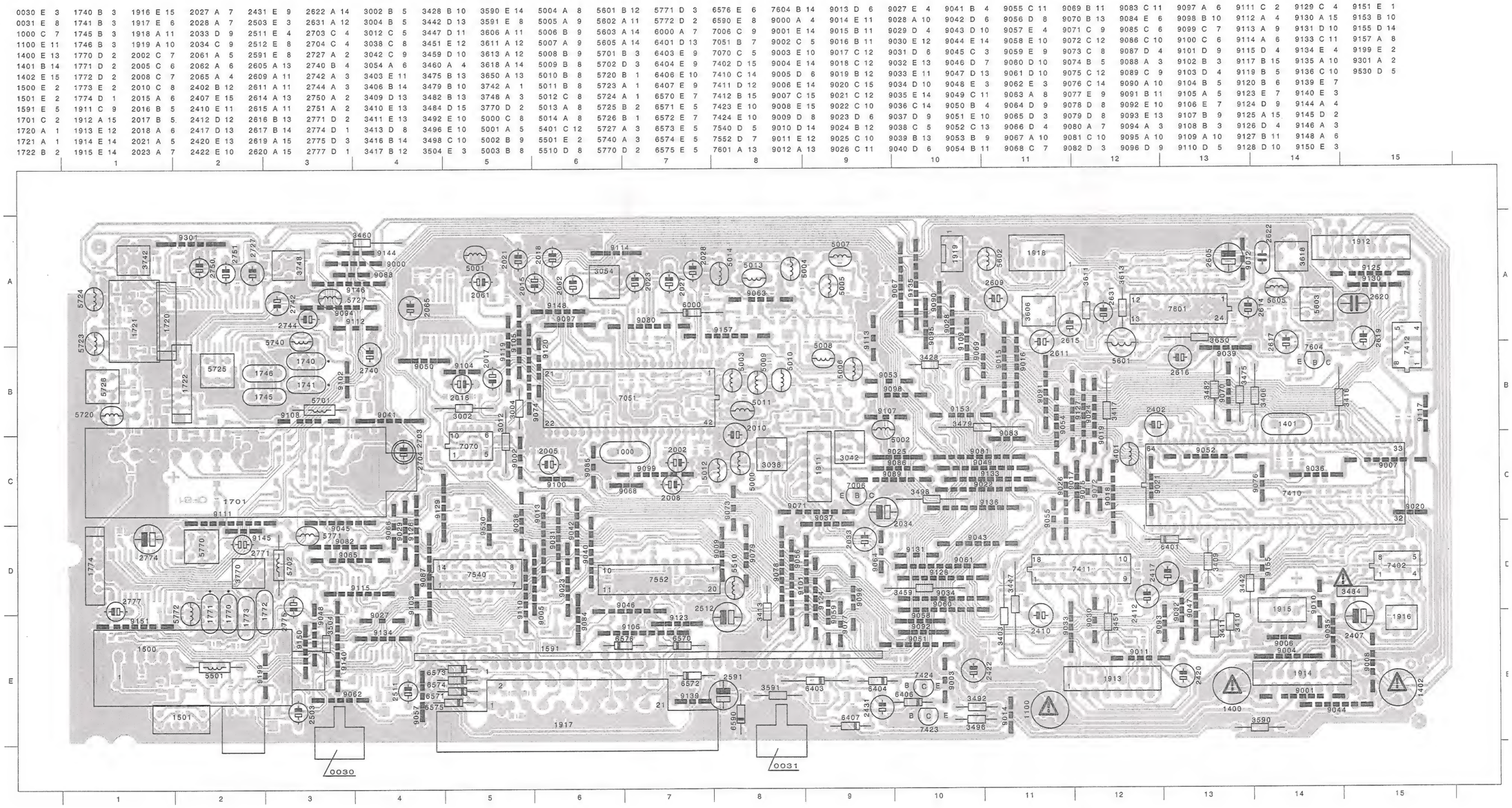
"Inserted components are dependent on the set type"

2001 B 7	2031 B 7	2051 A 8	2075 C 5	2500 E 2	2601 A 13	2717 B 1	2778 C 1	3018 A 7	3036 C 8	3400 D 14	3427 B 14	3448 D 14	3486 E 10	3509 E 7	3544 D 5	3602 A 13	3701 C 3	3760 A 2	3859 C 10	3921 C 8	3943 D 3	3987 E 6	7019 B 9	7550 E 4
2003 C 7	2032 A 9	2052 A 7	2403 C 12	2501 D 6	2602 A 13	2718 B 1	2779 E 1	3019 E 2	3037 C 8	3401 C 14	3429 D 13	3449 D 11	3487 C 13	3510 E 6	3545 D 4	3603 A 12	3702 C 3	3762 A 2	3900 C 3	3922 A 3	3944 E 3	3988 E 4	7020 A 9	7551 D 3
2004 C 6	2035 B 9	2053 A 8	2404 C 15	2502 E 3	2604 A 12	2719 B 1	2780 E 1	3020 B 7	3039 B 9	3404 C 14	3430 C 14	3450 D 12	3488 C 15	3511 D 4	3546 D 6	3604 A 12	3703 C 3	3764 A 2	3901 B 10	3923 A 4	3945 C 3	6720 A 1	7021 A 9	7571 C 4
2006 C 7	2036 B 9	2054 A 8	2405 C 14	2513 D 7	2606 A 12	2720 B 1	3000 C 7	3021 B 7	3040 B 9	3405 D 13	3431 C 13	3452 D 12	3489 C 15	3512 D 3	3547 D 5	3605 A 13	3704 C 3	3772 D 2	3902 E 2	3924 A 2	3947 B 1	6721 B 1	7022 C 5	7572 C 5
2007 C 7	2037 A 7	2055 A 8	2406 C 14	2514 D 7	2607 A 12	2721 A 1	3001 C 6	3022 B 7	3041 B 8	3407 B 15	3432 C 13	3453 D 11	3490 E 9	3513 D 4	3548 D 5	3607 A 12	3705 C 3	3773 E 2	3903 E 4	3925 D 6	3949 D 3	6823 B 1	7060 A 5	7605 A 14
2009 B 7	2038 A 7	2056 B 7	2408 E 15	2515 D 7	2608 A 12	2722 B 1	3003 A 5	3023 B 8	3043 C 9	3408 B 15	3433 C 15	3454 D 11	3491 E 9	3514 E 3	3549 D 5	3610 A 12	3720 A 1	3774 E 2	3904 C 10	3926 A 14	3950 C 11	6824 B 1	7403 D 11	7606 A 14
2011 B 6	2039 A 9	2057 B 7	2409 D 15	2516 D 6	2610 A 11	2723 A 1	3005 D 10	3024 A 7	3044 B 9	3412 C 15	3434 D 15	3455 D 11	3493 E 10	3515 E 7	3550 D 5	3612 A 12	3721 A 1	3775 D 3	3905 B 7	3928 E 12	3951 B 10	7000 C 4	7404 E 13	7609 B 15
2012 B 5	2040 A 9	2058 B 6	2411 D 11	2517 D 6	2612 B 12	2728 A 2	3006 C 6	3025 A 8	3045 B 8	3414 C 14	3435 D 15	3456 E 13	3494 E 9	3516 E 7	3551 D 5	3614 A 12	3722 B 1	3777 C 3	3906 D 4	3930 B 3	3952 D 8	7001 A 9	7405 C 14	7701 A 2
2013 B 5	2041 A 9	2059 C 7	2413 D 12	2540 D 4	2613 B 12	2741 A 1	3007 B 7	3026 A 9	3046 B 8	3415 C 13	3436 D 15	3457 D 12	3495 E 8	3517 D 6	3570 E 7	3615 B 12	3725 C 3	3778 E 3	3910 E 3	3931 C 15	3955 A 3	7002 B 6	7420 E 9	7721 A 2
2014 A 5	2042 A 9	2060 A 5	2414 D 12	2541 D 5	2618 A 14	2743 A 3	3008 B 5	3027 A 9	3047 A 8	3418 C 14	3437 D 15	3458 D 14	3497 C 15	3518 D 6	3571 E 5	3616 B 12	3726 C 3	3779 E 1	3911 A 1	3932 D 7	3956 A 10	7003 B 6	7421 E 9	7722 A 2
2019 C 8	2043 A 8	2064 A 5	2415 D 12	2542 D 5	2621 A 14	2747 A 3	3009 A 6	3028 A 9	3048 A 8	3419 C 15	3438 D 15	3461 A 15	3499 E 9	3519 E 3	3572 E 5	3617 A 14	3730 A 3	3781 E 1	3912 E 3	3934 C 5	3964 D 1	7007 A 7	7500 E 2	7723 A 3
2020 B 7	2044 B 8	2066 A 4	2416 D 12	2543 D 5	2632 A 13	2748 B 2	3010 B 6	3029 A 9	3049 A 8	3420 C 15	3439 D 15	3462 A 15	3500 E 2	3520 E 2	3573 E 5	3619 A 15	3731 A 3	3782 A 1	3913 D 3	3936 D 6	3980 C 3	7009 B 9	7501 E 2	7724 B 4
2022 B 7	2045 B 8	2067 B 4	2418 D 12	2544 E 6	2650 A 13	2749 A 1	3011 A 7	3030 A 9	3050 A 8	3421 C 13	3440 D 15	3471 D 11	3501 E 1	3521 E 3	3578 E 5	3620 A 14	3736 A 2	3825 B 2	3914 D 4	3937 B 4	3981 C 3	7010 B 7	7502 E 6	7772 D 1
2024 A 7	2046 B 8	2068 B 4	2419 D 14	2570 E 5	2652 A 12	2752 A 3	3013 A 7	3031 A 9	3051 A 8	3422 C 14	3441 D 15	3474 E 9	3502 E 2	3522 E 5	3579 C 5	3621 B 14	3737 A 1	3826 B 2	3915 B 6	3938 D 7	3982 C 3	7013 A 8	7503 E 4	7823 B 2
2025 A 7	2047 B 8	2069 A 5	2421 E 11	2571 E 5	2700 C 3	2770 D 1	3014 A 7	3032 A 8	3052 A 9	3423 C 13	3443 B 13	3480 C 15	3503 E 2	3540 D 5	3580 E 4	3623 A 14	3744 B 4	3829 B 1	3917 E 3	3939 C 8	3983 C 2	7014 A 8	7504 D 3	7824 B 2
2026 A 7	2048 C 8	2071 B 5	2423 E 14	2572 E 5	2701 C 2	2772 E 1	3015 A 7	3033 A 9	3053 A 7	3424 C 15	3444 E 12	3481 D 14	3505 E 1	3541 D 5	3581 E 4	3624 B 14	3745 B 2	3832 B 2	3918 B 8	3940 D 8	3984 C 3	7015 A 8	7505 E 3	7826 C 3
2029 B 7	2049 C 9	2073 C 5	2424 B 15	2590 E 7	2702 C 2	2773 D 1	3016 C 9	3034 A 9	3068 A 4	3425 C 15	3445 E 12	3483 B 14	3507 E 4	3542 D 5	3600 A 12	3625 B 14	3746 B 2	3833 B 2	3919 E 6	3941 B 6	3985 A 11	7016 B 8	7506 E 5	
2030 B 7	2050 B 8	2074 C 5	2425 E 9	2600 A 13	2716 B 1	2776 D 1	3017 C 5	3035 B 5	3069 A 4	3426 C 14	3446 C 13	3485 B 13	3508 E 4	3543 D 5	3601 A 13	3638 A 14	3747 A 3	3834 B 2	3920 E 3	3942 D 4	3986 E 4	7018 B 9	7507 D 3	

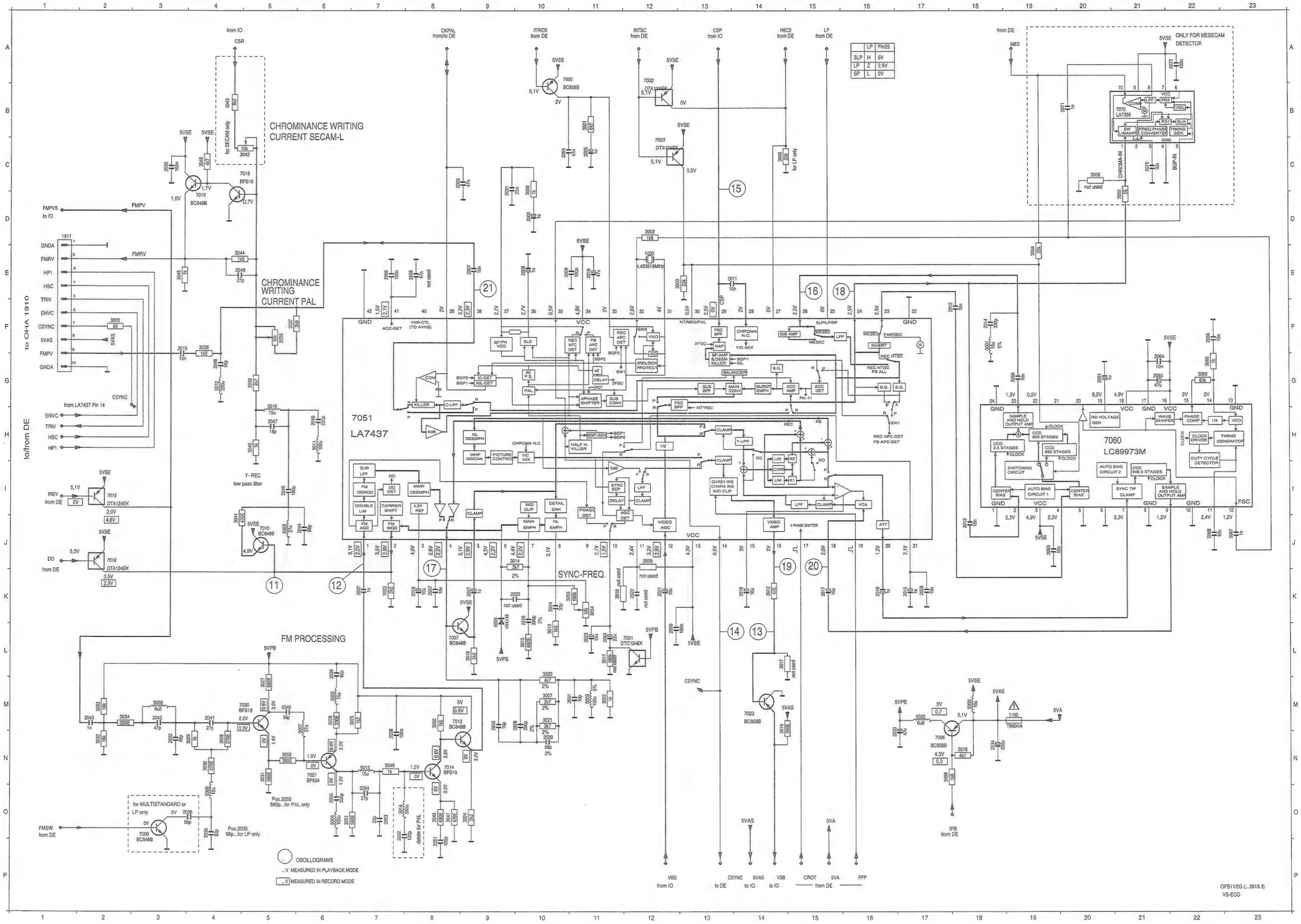


Family Board OFB

"Inserted components are dependent on the set type"



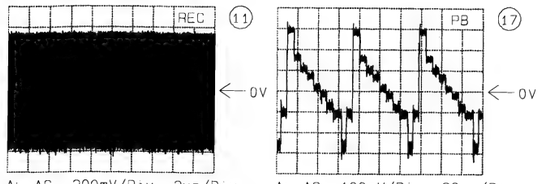
Family Board OFB - Video-Signal-Processing - VS



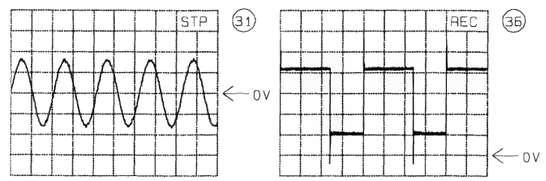
	LP	Pin25
SLP	H	5V
LP	Z	2,5V
SP	L	0V

1000	E12	5008	M 3	2027	K 9
1100	M19	5009	J 5	2028	K 8
1911	D 1	5010	H 5	2029	M10
2001	C 9	5011	H 6	2030	N10
2002	D10	5012	G 4	2031	M11
2003	C 8	5013	N 7	2032	N 3
2004	C10	5014	O 7	2033	M16
2005	C11	6000	K 9	2034	N18
2006	E 7	7000	A10	2035	O 4
2007	E 9	7001	L11	2036	O 4
2008	E10	7002	A12	2037	K 7
2009	E10	7003	B12	2038	N 7
2010	E11	7006	N17	2039	L 6
2011	E14	7007	L 8	2040	M 5
2012	F18	7009	O 3	2041	M 4
2013	J18	7010	J 5	2042	M 3
2014	F18	7013	M 8	2043	M 2
2015	K17	7014	N 8	2044	J 6
2016	K16	7015	I 2	2045	I 5
2017	K15	7016	J 2	2046	H 6
2018	K14	7018	C 4	2047	H 5
2019	F 3	7019	D 4	2048	G 4
2020	L12	7020	M 4	2049	E 4
2021	K12	7021	N 6	2050	C 3
2022	K12	7022	M14	2051	P 8
2023	L11	7051	H 7	2052	O 7
2024	K10	7060	H20	2053	O 7
2025	K10	7070	B21	2054	O 7
2026	K10			2055	O 6
				2056	M 9
				2057	K 8
				2058	K17
				2059	E 8
				2060	G19
				2061	G20
				2062	L11
				2064	G21
				2065	G21
				2066	F22
				2067	J23
				2068	J22
				2069	J19
				2071	B20
				2073	A22
				2075	C21
				3000	C10
				3001	B11
				3002	D12
				3003	E13
				3004	E19
				3005	F 2
				3006	C14
				3007	M10
				3008	C20
				3009	J12
				3010	K11
				3011	L11
				3012	K14
				3013	L10
				3014	J10
				3015	L10
				3016	N18
				3017	L14
				3018	L 9
				3019	M14
				3020	L10
				3021	M10
				3022	M11
				3023	K 7
				3024	O 9
				3025	M 7
				3026	M 6
				3027	M 5
				3028	N 4
				3029	N 4
				3030	N 4
				3031	N 5
				3032	N 2
				3033	M 2
				3034	M 2
				3035	D21
				3036	F 4
				3037	F 5
				3038	F 5
				3039	G 5
				3040	H 5
				3041	J 4
				3042	O 5
				3043	B 4
				3044	E 4
				3045	E 5
				3046	C 4
				3047	O 8
				3048	O 8
				3049	N 7
				3050	M 8
				3051	O 6
				3052	N 5
				3053	K11
				3054	K11
				3068	G22
				3069	G22
				3498	N17
				5000	M18
				5001	F18
				5002	M17
				5003	M11
				5004	O 6
				5005	M 6
				5006	O 4
				5007	M 6

Oscillograms VS

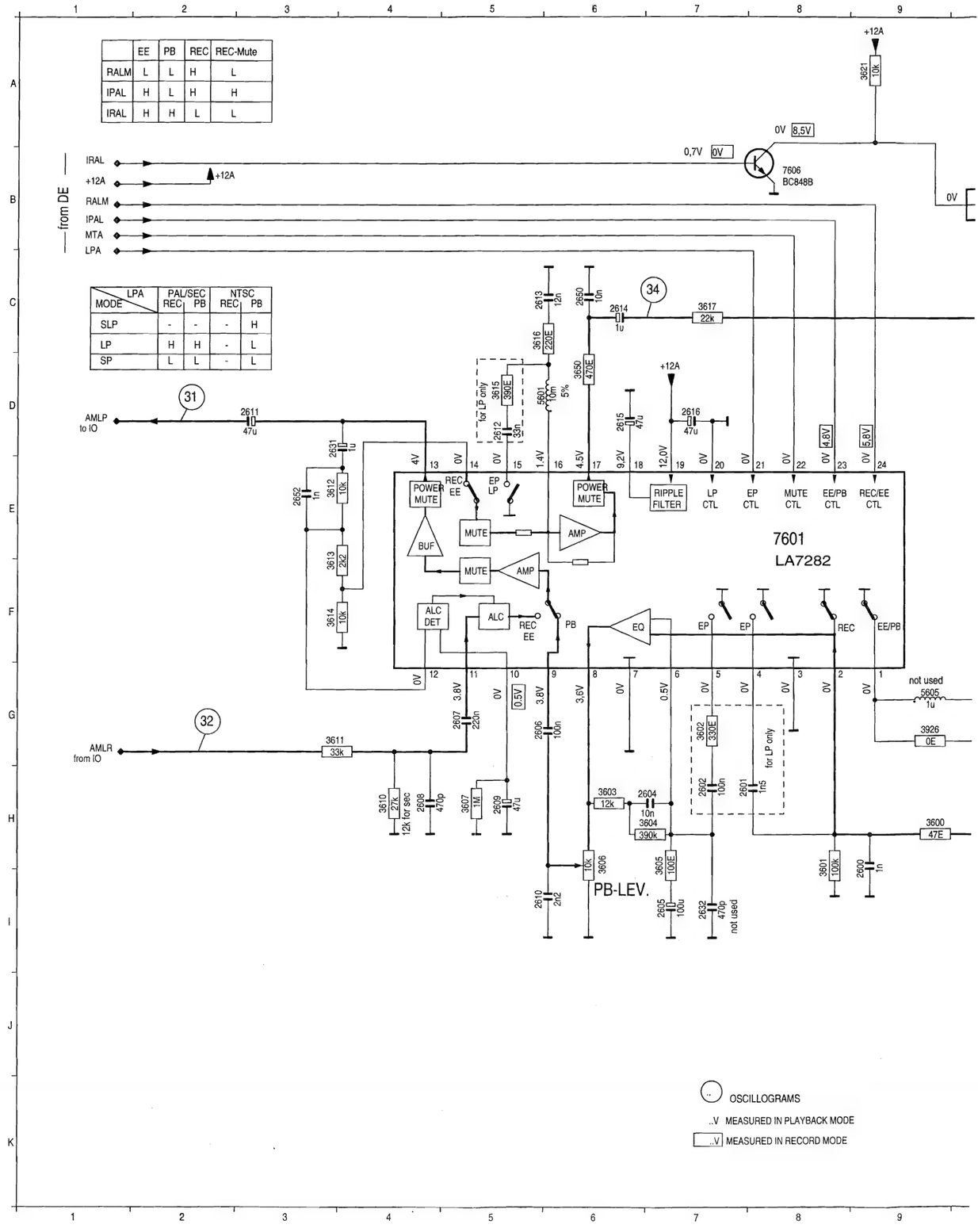


Oscillograms AL

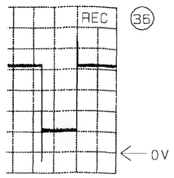


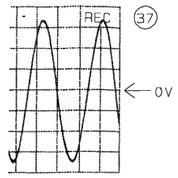
3-11

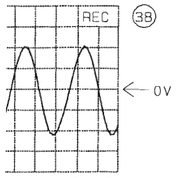
Family Board OFB - Audio Linear - AL



Family Board OFB - Audio Linear - AL







	EE	PB	REC	REC-Mute
RALM	L	L	H	L
IPAL	H	L	H	H
IRAL	H	H	L	L

MODE \ LPA	PAL/SEC REC	PAL/SEC PB	NTSC REC	NTSC PB
SLP	-	-	-	H
LP	H	H	-	L
SP	L	L	-	L

from DE: IRAL, +12A, RALM, IPAL, MTA, LPA

AMLP to IO (31) — AMLR from IO (32)

7601 LA7282: POWER MUTE, REC EE, EP LP, POWER MUTE, RIPPLE FILTER, LP CTL, EP CTL, MUTE CTL, EE/PB CTL, REC/EE CTL; BUF, MUTE, AMP, ALC DET, ALC, REC EE, PB, EQ, EP, EP, REC, EE/PB

7606 BC848B; 7605 DTC124EK; 7604 BC328-40; 7609 BC817-40

BIAS; PB-LEV.; ERASE FREQU

CTL2 to DE, CTL1 to DE

TD1 — TO Tape-Deck: 1918 CTL1, CTL2, AEH1, AEH2, APH, AEH2, ARH

TD2 — TO Tape-Deck: 1919 MEH2, MEH1

not used: 5605 1u, 3926 0E

(..) OSCILLOGRAMS

..V MEASURED IN PLAYBACK MODE

[..V] MEASURED IN RECORD MODE

OFB11/2G (...3919.3)
AL-ECO

1918 E15
1919 H15
2600 H 9
2601 H 7
2602 H 7
2604 H 7
2605 I 7
2606 G 5
2607 G 5
2608 H 4
2609 H 5
2610 I 5
2611 D 3
2612 D 5
2613 C 5
2614 C 6
2615 D 6
2616 D 7
2617 A10
2618 C13
2619 A12
2620 B14
2621 B14
2622 B16
2631 D 3
2632 I 7
2650 C 6
2652 E 3
3600 H 9
3601 H 8
3602 G 7
3603 H 6
3604 H 7
3605 H 7
3606 H 6
3607 H 5
3610 H 4
3611 G 3
3612 E 3
3613 F 3
3614 F 3
3615 D 5
3616 C 5
3617 C 7
3618 D14
3619 B13
3620 A14
3621 A 9
3623 B10
3624 A11
3625 A11
3638 B14
3650 D 6
3926 G 9
5601 D 6
5602 F14
5603 B15
5605 G 9
7601 E 8
7604 B12
7605 B10
7606 B 8
7609 B13

3-12

3-12

Family Board OFB - Frontend - FV

* VERSION						
Pos.	PAL-BG	PAL-I	PAL-I-IR	PAL-BG/SEC-L	PAL-BG/SEC-DK	PAL-BG/SEC-DK
	/01	/05	/07	/39	/59	/59 Amtsblatt
1701	UV916E	U944C	UV916E	UV916E	UV916E	UV916E
1720	——	——	——	——	——	——
1721	——	——	——	K6256K	——	K6255K
1722	——	——	——	L9453M	——	——
1740	——	——	——	TRAP 5,5MHz	——	TRAP 5,5MHz
1741	——	——	——	——	——	TRAP 6,5MHz
1745	——	——	——	BP 5,5MHz	——	BP 5,5MHz
1746	——	——	——	——	——	BP 6,5MHz
1770	——	——	——	——	——	——
1771	TRAP 5,5MHz	TRAP 6,0MHz	TRAP 6,0MHz	——	TRAP 5,5MHz	——
1772	——	——	——	——	BP 6,5MHz	——
1773	BP 5,5MHz	BP 6,0MHz	BP 6,0MHz	——	BP 5,5MHz	——
1774	G1966M	J1952M	J1952M	——	K2955M	——
2703	——	——	——	22u	——	——
2704	10u	10u	10u	——	10u	10u
2717	——	——	——	——	——	——
3746	——	——	——	——	——	560E
3747	——	——	——	330E	——	220E
3772	180E	180E	180E	——	180E	——
5740	——	——	——	15u	——	10u
5772	10u	10u	10u	——	6u8	——
7701	——	——	——	TDA9812T	——	TDA9812T
7772	TDA5950	TDA5950	TDA5950	——	TDA5950	——

IS1	IPBV	VBS	AOTDA
L	L	mute	mute
L	H	FV	FA
H	L	mute	mute
H	H	VIN1	AIN1

1701	L 3
1720	J 9
1721	K 9
1722	H 9
1740	N14
1741	O14
1745	N15
1746	O15
1770	A16
1771	A16
1772	A15
1773	B15
1774	D 9
2700	J 2
2701	O 2
2702	O 3
2703	J 2
2704	J 3
2716	L 7
2717	K 7
2718	L 7
2719	L 7
2720	K 7
2721	L 8
2722	I 7
2723	M 8
2727	K18
2728	K18
2740	N13
2741	N13
2742	N17
2743	N17
2744	M18
2747	H15
2748	H13
2749	H12
2750	H11
2751	K19
2752	H11
2770	F12
2771	F13
2772	B12
2773	D17
2774	D18
2775	B13
2776	B11
2777	C10
2778	D 8
2779	B13
2780	B13
3701	I 3
3702	O 1
3703	O 2
3704	I 4
3705	O 3
3720	L 7
3721	L 7
3722	K 6
3725	I 4
3726	J 4
3730	H18
3731	H18
3736	K17
3737	H13
3742	N12
3744	P13
3745	N15
3746	O15
3747	N14
3748	G10
3760	L19
3762	L19
3764	K20
3770	F11
3772	B15
3773	B15
3774	B15
3775	B12
3777	G19
3778	A13
3779	B13
3781	K21
3782	L 8
3825	J 6
3826	H 6
3829	I 7
3832	I 8
3833	H 7
3834	H 8
3911	N14
5701	I 1
5702	P 2
5720	M 5
5723	L 8
5724	L 8
5725	H14
5726	L 7
5727	N18
5740	O14
5770	E16
5771	C17
5772	B15
6720	L 8
6721	L 8
6823	H 7
6824	I 7
7701	I15
7721	L20
7722	M20
7723	G 9
7724	O13
7772	E15
7823	I 8
7824	I 8
7826	I 3

A: DC, 500mV/Div
IC 7051 Pin 16

A: AC, 100mV/Div
Tuner 1701 Pin

A: AC, 500mV/Div
IC 7701 Pin 10

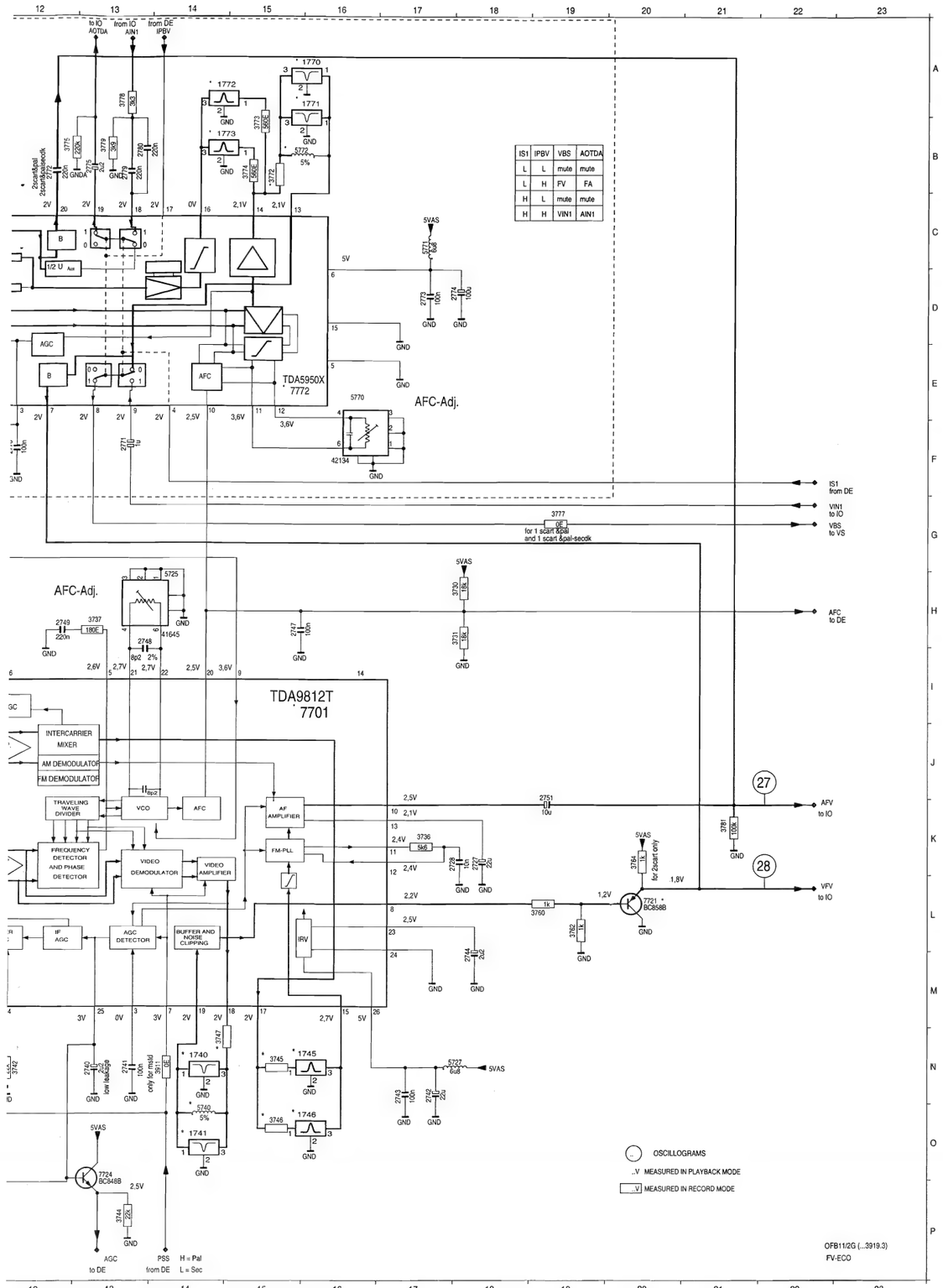
A: DC, 500mV/Div
Transistor 7721

A: AC, 500mV/Div
Capacitor 2611

OSCILLOGRAMS
..V MEASURED IN PLAYBACK MODE
..V MEASURED IN RECORD MODE

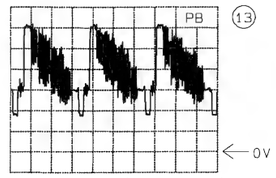
OFB11/2G (...3919.3)
FV-ECO

3-12

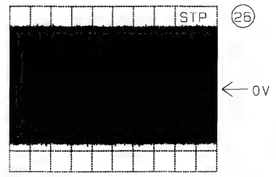


IS1	IPBV	VBS	AOTDA
L	L	mute	mute
L	H	FV	FA
H	L	mute	mute
H	H	VIN1	AIN1

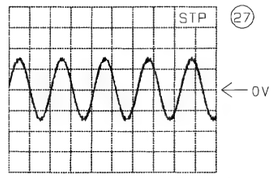
1701 L 3
1720 J 9
1721 K 9
1722 H 9
1740 N14
1741 O14
1745 N15
1746 O15
1770 A16
1771 A16
1772 A15
1773 B15
1774 D 9
2700 J 2
2701 O 2
2702 O 3
2703 J 2
2704 J 3
2716 L 7
2717 K 7
2718 L 7
2719 L 7
2720 K 7
2721 L 8
2722 I 7
2723 M 8
2727 K18
2728 K18
2740 N13
2741 N13
2742 N17
2743 N17
2744 M18
2747 H15
2748 H13
2749 H12
2750 H11
2751 K19
2752 H11
2770 F12
2771 F13
2772 B12
2773 D17
2774 D18
2775 B13
2776 B11
2777 C10
2778 D 8
2779 B13
2780 B13
3701 I 3
3702 O 1
3703 O 2
3704 I 4
3705 O 3
3720 L 7
3721 L 7
3722 K 6
3725 I 4
3726 J 4
3730 H18
3731 H18
3736 K17
3737 H13
3742 N12
3744 P13
3745 N15
3746 O15
3747 N14
3748 G10
3760 L19
3762 L19
3764 K20
3770 F11
3772 B15
3773 B15
3774 B15
3775 B12
3777 G19
3778 A13
3779 B13
3781 K21
3782 L 8
3825 J 6
3826 H 6
3829 I 7
3832 I 8
3833 H 7
3834 H 8
3911 N14
5701 I 1
5702 P 2
5720 M 5
5723 L 8
5724 L 8
5725 H14
5726 L 7
5727 N18
5740 O14
5770 E16
5771 C17
5772 B15
6720 L 8
6721 L 8
6823 H 7
6824 I 7
7701 I15
7721 L20
7722 M20
7723 G 9
7724 O13
7772 E15
7823 I 8
7824 I 8
7826 I 3



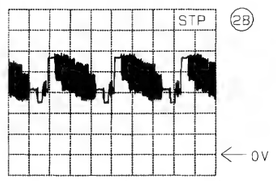
A: DC, 500mV/Div, 20us/Div
IC 7051 Pin 16



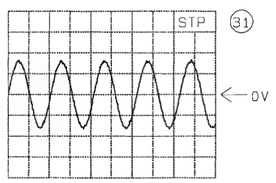
A: AC, 100mV/Div, 1ms/Div
Tuner 1701 Pin 17



A: AC, 500mV/Div, 500us/Div
IC 7701 Pin 10



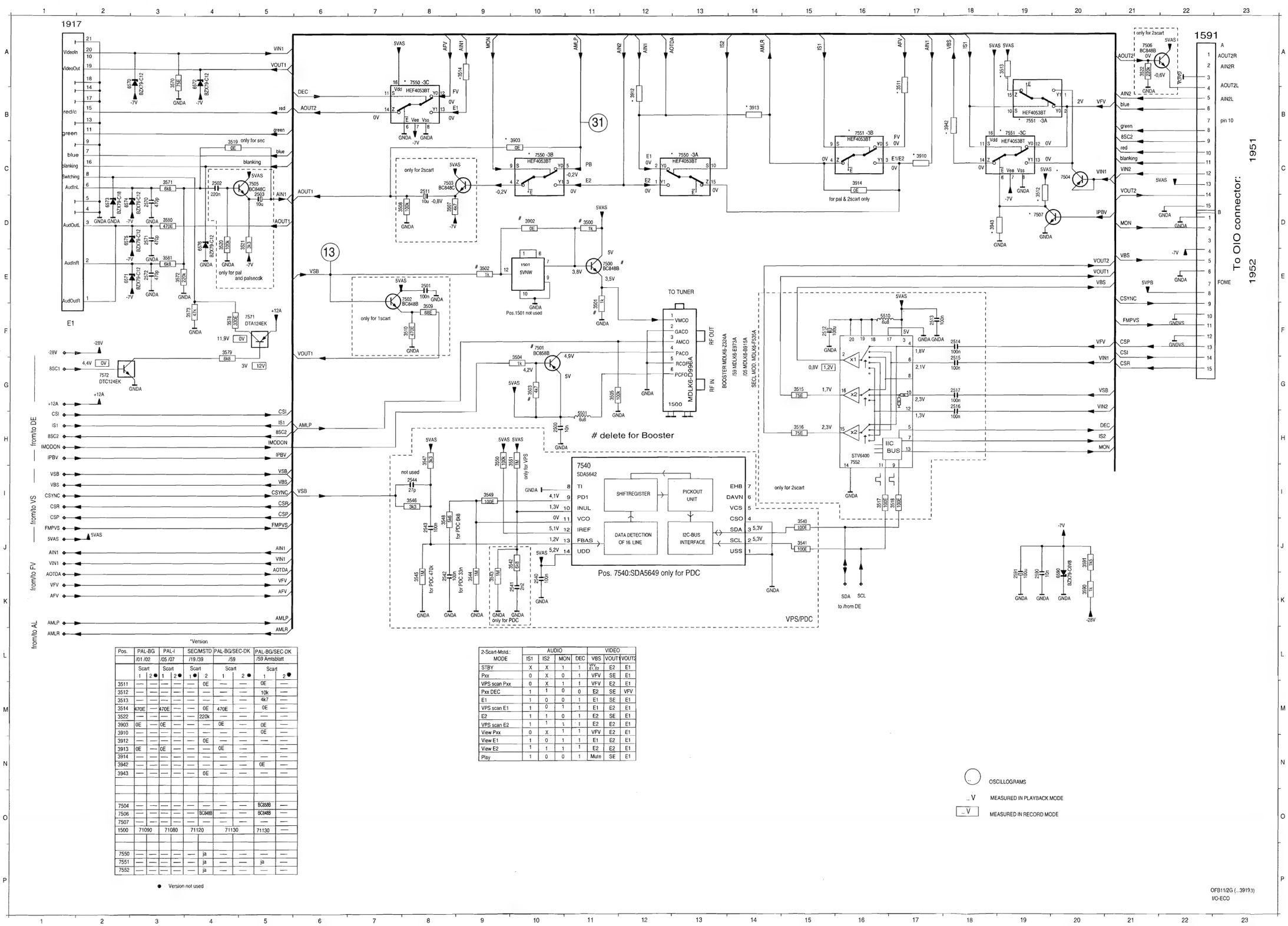
A: DC, 500mV/Div, 20us/Div
Transistor 7721 Emitter



A: AC, 500mV/Div, 500us/Div
Capacitor 2611

Remarks:

Family Board OFB - In/Out - I/O



*Version

Pos.	PAL-BG /01 /02		PAL-i /05 /07		SEC/MSTD /19 /39		PAL-BG/SEC-DK /59		PAL-BG/SEC-DK /59 Amtsblatt	
	Scart 1	Scart 2 ●	Scart 1	Scart 2 ●	Scart 1 ●	Scart 2	Scart 1	Scart 2 ●	Scart 1	Scart 2 ●
3511	—	—	—	—	—	0E	—	—	0E	—
3512	—	—	—	—	—	—	—	—	10k	—
3513	—	—	—	—	—	—	—	—	4k7	—
3514	470E	—	470E	—	—	0E	470E	—	0E	—
3522	—	—	—	—	—	220k	—	—	—	—
3903	0E	—	0E	—	—	—	0E	—	0E	—
3910	—	—	—	—	—	—	—	—	0E	—
3912	—	—	—	—	—	0E	—	—	—	—
3913	0E	—	0E	—	—	0E	—	—	—	—
3914	—	—	—	—	—	—	—	—	—	—
3942	—	—	—	—	—	—	—	—	0E	—
3943	—	—	—	—	—	0E	—	—	—	—
7504	—	—	—	—	—	—	—	—	BC848B	—
7506	—	—	—	—	—	BC848B	—	—	BC848B	—
7507	—	—	—	—	—	—	—	—	—	—
1500	71090		71080		71120		71130		71130	—
7550	—	—	—	—	—	ja	—	—	—	—
7551	—	—	—	—	—	ja	—	—	ja	—
7552	—	—	—	—	—	ja	—	—	—	—

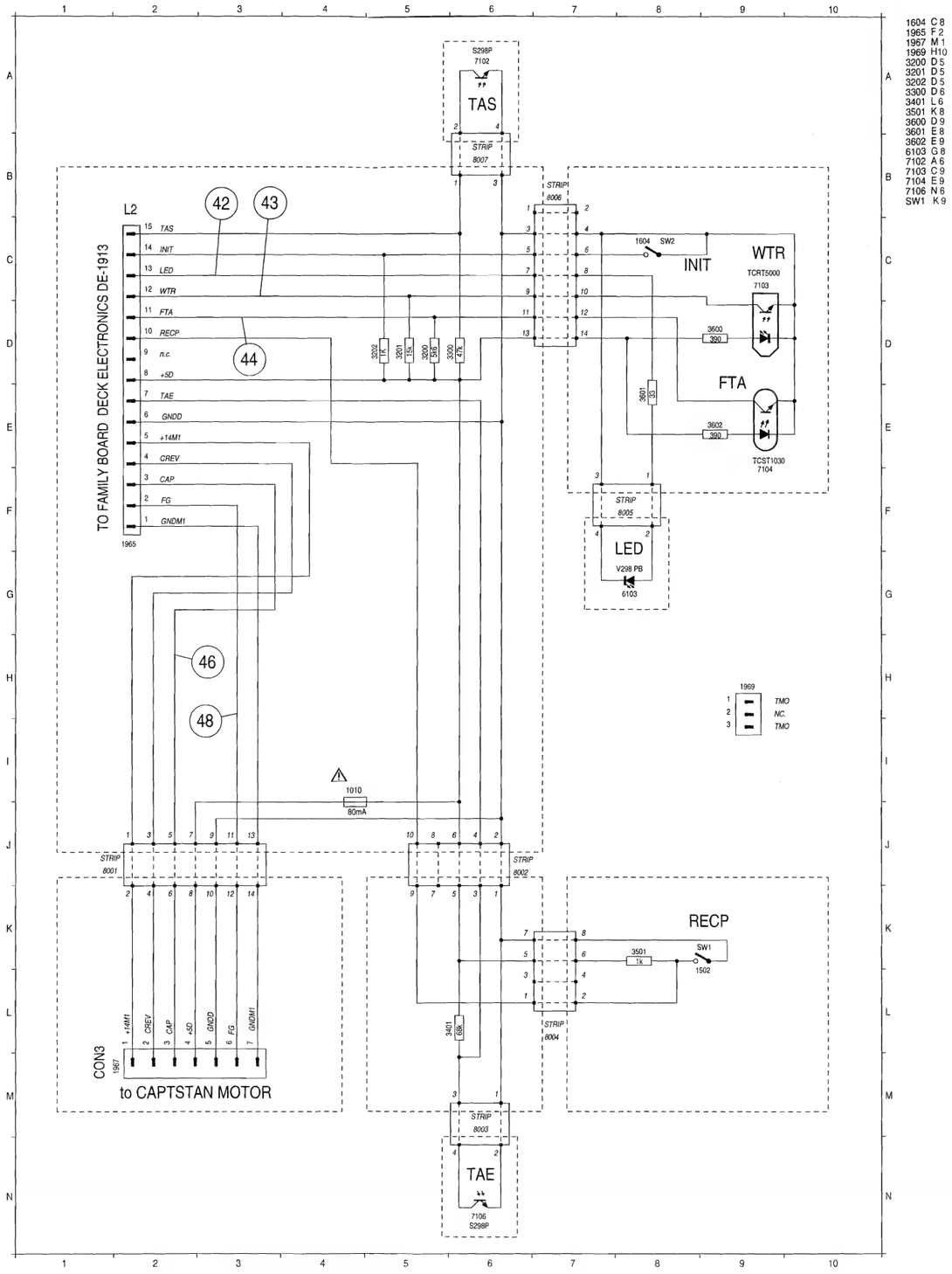
● Version not used

2-Scart-Mstd.: MODE	AUDIO IS1	IS2	MON	DEC	VIDEO VBS (V7 E1.8)	VOUT1	VOUT2
STBY	X	X	1	1	VFV	E2	E1
Pxx	0	X	0	1	VFV	SE	E1
VPS scan Pxx	0	X	1	1	VFV	E2	E1
Pxx DEC	1	1	0	0	E2	SE	VFV
E1	1	0	0	1	E1	SE	E1
VPS scan E1	1	0	1	1	E1	E2	E1
E2	1	1	0	1	E2	SE	E1
VPS scan E2	1	1	1	1	E2	E2	E1
View Pxx	0	X	1	1	VFV	E2	E1
View E1	1	0	1	1	E1	E2	E1
View E2	1	1	1	1	E2	E2	E1
Play	1	0	0	1	Mute	SE	E1

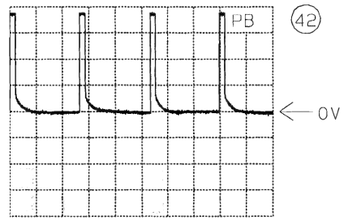
OSCILLOGRAMS
.. V MEASURED IN PLAYBACK MODE
.. V MEASURED IN RECORD MODE

1500 G12
1501 E10
1591 A22
1917 A1
2500 H10
2501 E8
2502 C4
2503 D5
2511 C8
2512 F15
2513 F17
2514 F18
2515 G18
2516 G18
2517 G18
2540 K10
2541 K10
2542 K8
2543 J8
2544 I8
2570 D3
2571 D3
2572 E3
2590 K19
2591 K19
3500 D11
3501 F11
3502 E9
3503 G10
3504 G10
3505 G11
3507 D8
3508 D7
3509 F8
3510 F8
3511 A17
3512 C19
3513 A19
3514 A9
3515 G15
3516 H15
3517 I16
3518 I17
3519 C4
3520 D4
3521 D5
3522 A21
3540 J15
3541 J15
3542 J10
3543 K9
3544 K9
3545 K8
3546 I8
3547 H8
3548 J8
3549 I9
3550 H9
3551 H10
3570 A3
3571 C3
3572 E3
3573 F4
3578 F4
3579 F4
3580 D3
3581 E3
3590 K20
3591 J20
3902 D10
3903 C10
3910 C17
3912 B12
3913 B14
3914 C16
3942 B18
3943 D18
5501 H11
5510 F16
6570 A3
6571 E2
6572 A4
6573 D2
6574 D2
6575 D2
6576 D4
6590 K20
7500 E11
7501 F10
7502 E7
7503 C8
7504 C20
7505 C5
7506 A21
7507 D19
7540 I11
7550 A8
7550 C13
7550 C10
7551 B19
7551 B19
7551 B16
7552 I16
7571 F5
7572 G2

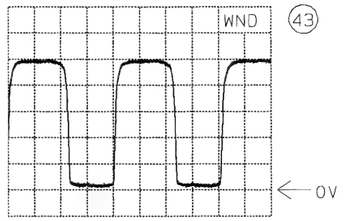
Tape deck sensor board



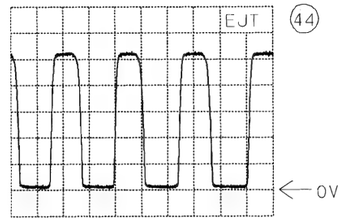
3-14



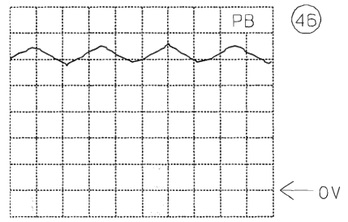
A: DC, 1 V/Div, 5ms/Div
Connector 1913 Pin 13



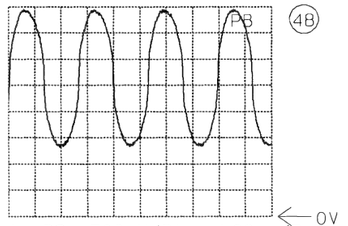
A: DC, 1 V/Div, 5ms/Div
Connector 1913 Pin 12



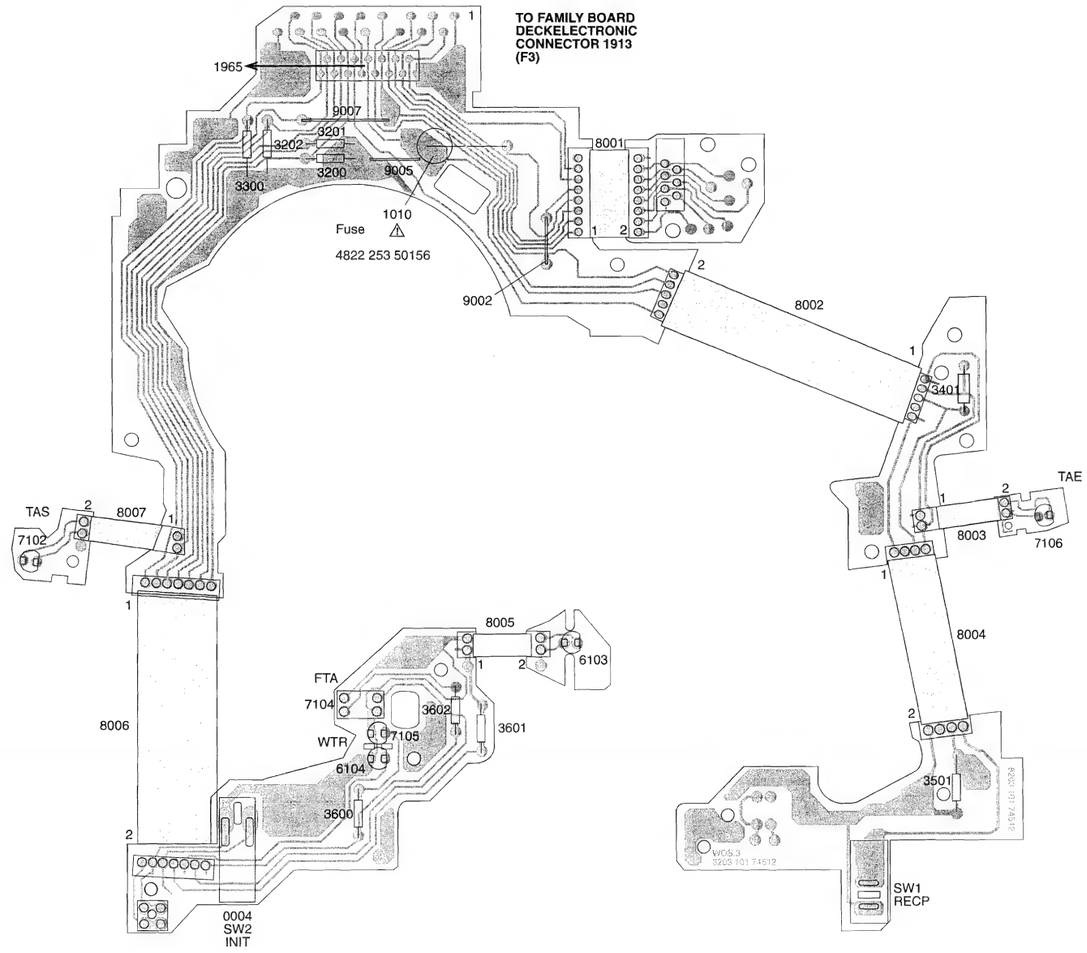
A: DC, 1 V/Div, 10ms/Div
Connector 1913 Pin 11



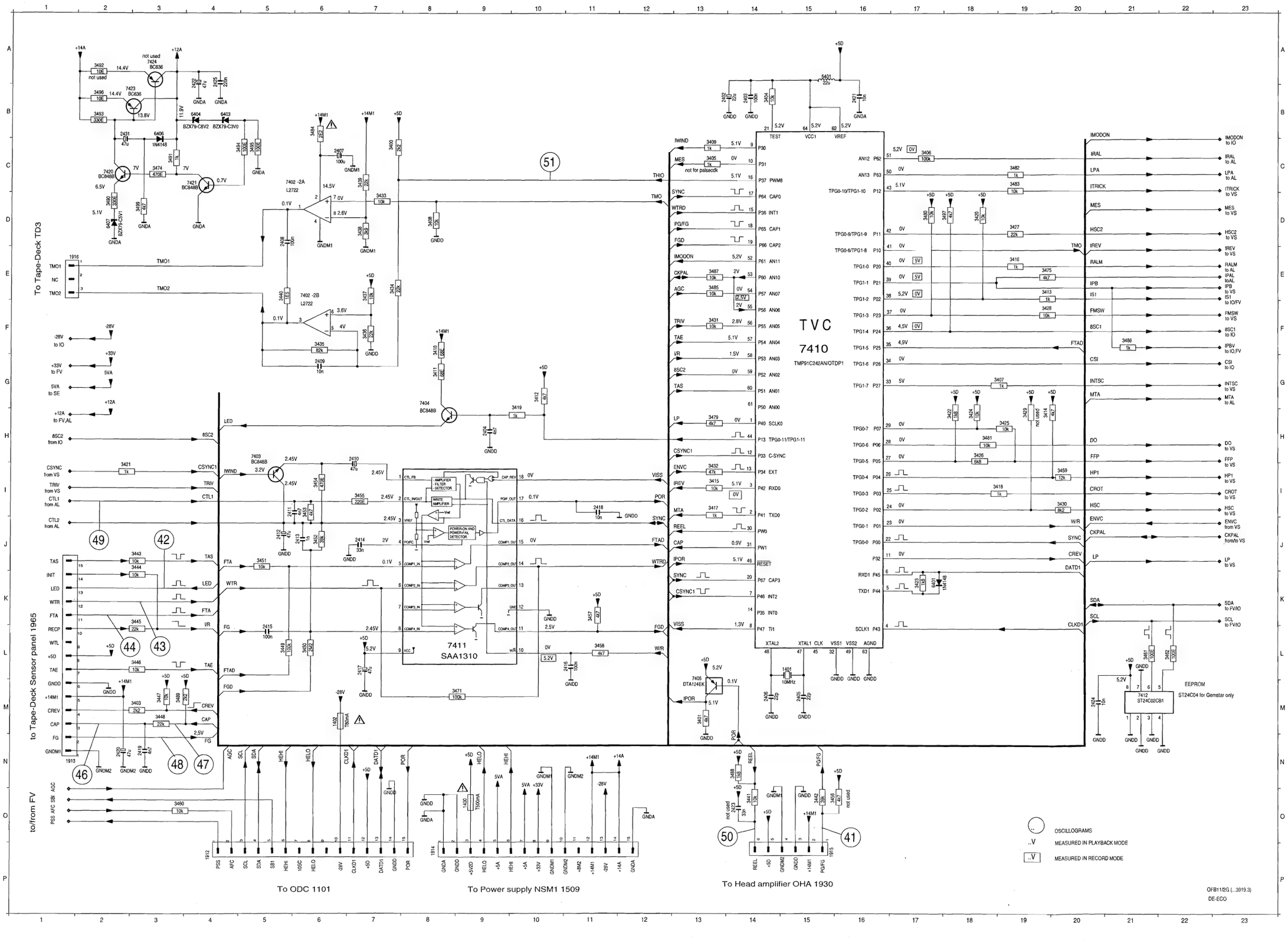
A: DC, 500mV/Div, 10us/Div
Connector 1913 Pin 3



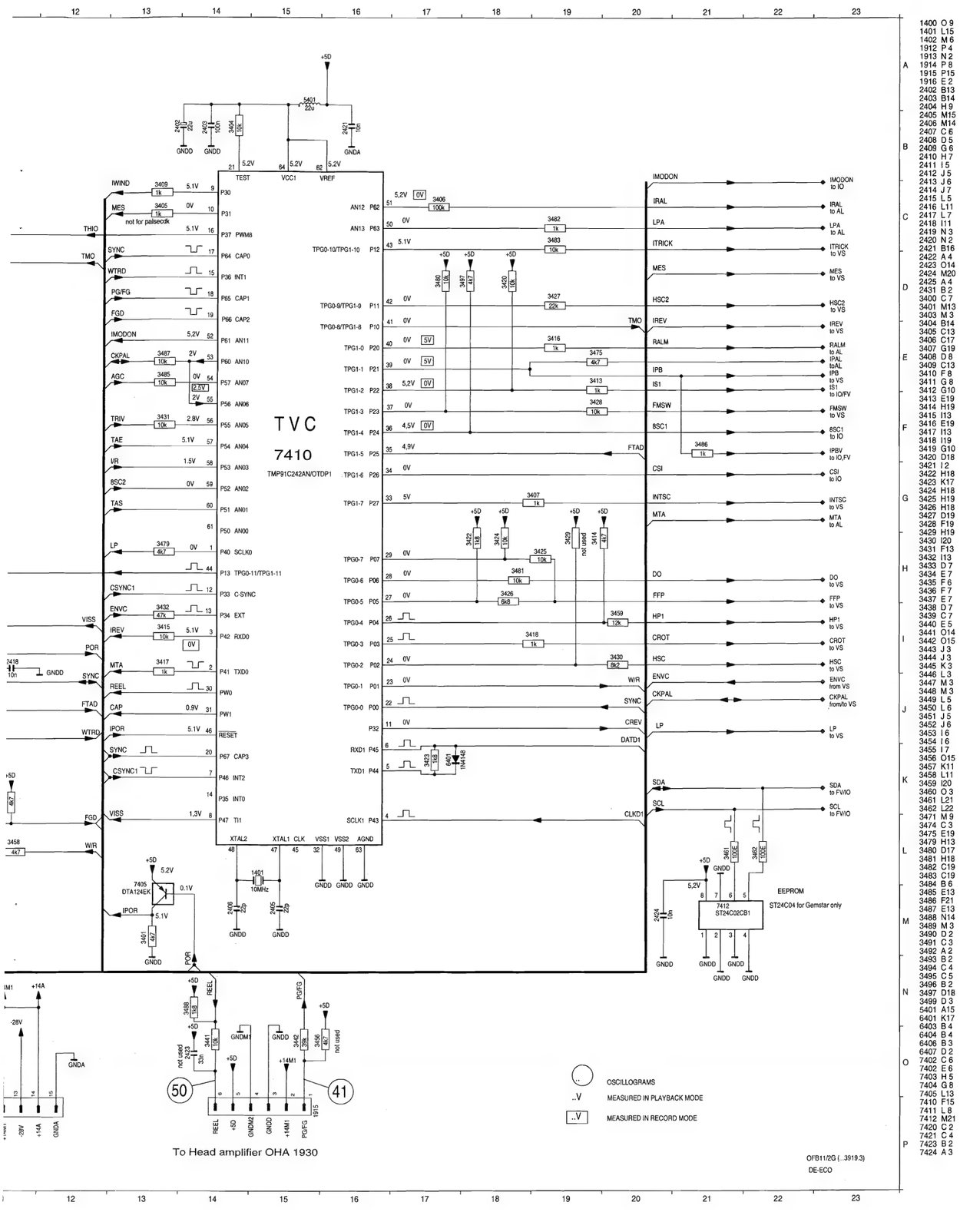
A: DC, 500mV/Div, 500us/Div
IC 7411 Pin 8

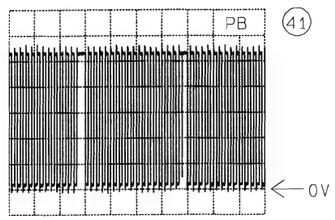


Family Board OFB - Deck-Electronics - DE

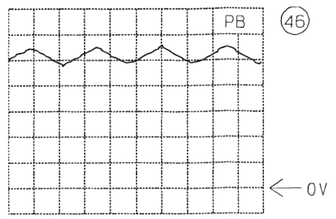


1400 O 9
1401 L15
1402 M 6
1912 P 4
1913 N 2
1914 P 8
1915 P15
1916 E 2
2402 B13
2403 B14
2404 H 9
2405 M15
2406 M14
2407 C 6
2408 D 5
2409 G 6
2410 H 7
2411 I 5
2412 J 5
2413 J 6
2414 J 7
2415 L 5
2416 L11
2417 L 7
2418 I11
2419 N 3
2420 N 2
2421 B16
2422 A 4
2423 O14
2424 M20
2425 A 4
2431 B 2
3400 C 7
3401 M13
3403 M 3
3404 B14
3405 C13
3406 C17
3407 G19
3408 D 8
3409 C13
3410 F 8
3411 G 8
3412 G10
3413 E19
3414 H19
3415 I13
3416 E19
3417 I13
3418 I19
3419 G10
3420 D18
3421 I 2
3422 H18
3423 K17
3424 H18
3425 H19
3426 H18
3427 D19
3428 F19
3429 H19
3430 I20
3431 F13
3432 I13
3433 D 7
3434 E 7
3435 F 6
3436 F 7
3437 E 7
3438 D 7
3439 C 7
3440 E 5
3441 O14
3442 O15
3443 J 3
3444 J 3
3445 K 3
3446 L 3
3447 M 3
3448 M 3
3449 L 5
3450 L 6
3451 J 5
3452 J 6
3453 I 6
3454 I 6
3455 I 7
3456 O15
3457 K11
3458 L11
3459 I20
3460 O 3
3461 L21
3462 L22
3471 M 9
3474 C 3
3475 E19
3479 H13
3480 D17
3481 H18
3482 C19
3483 C19
3484 B 6
3485 E13
3486 F21
3487 E13
3488 N14
3489 M 3
3490 D 2
3491 C 3
3492 A 2
3493 B 2
3494 C 4
3495 C 5
3496 B 2
3497 D18
3499 D 3
5401 A15
6401 K17
6403 B 4
6404 B 4
6406 B 3
6407 D 2
7402 C 6
7402 E 6
7403 H 5
7404 G 8
7405 L13
7410 F15
7411 L 8
7412 M21
7420 C 2
7421 C 4
7423 B 2
7424 A 3

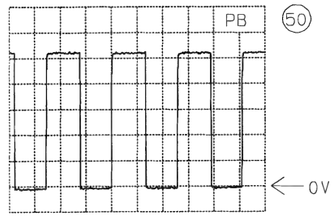




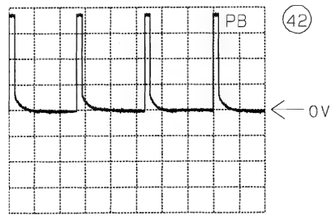
A: DC, 1 V/Div, 10ms/Div
Connector 1915 Pin 1



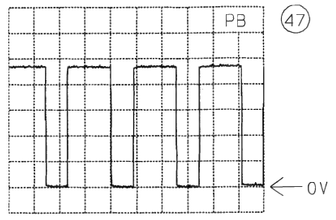
A: DC, 500mV/Div, 10us/Div
Connector 1913 Pin 3



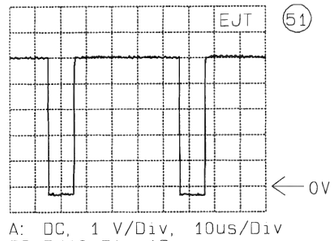
A: DC, 1 V/Div, 10us/Div
IC 7410 Pin 30



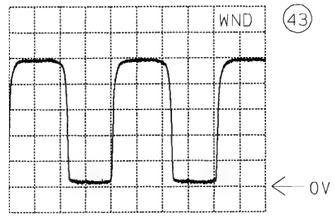
A: DC, 1 V/Div, 5ms/Div
Connector 1913 Pin 13



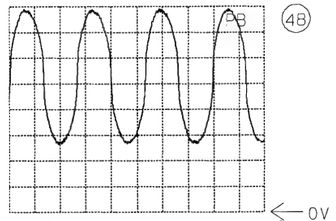
A: DC, 1 V/Div, 10us/Div
IC 7410 Pin 31



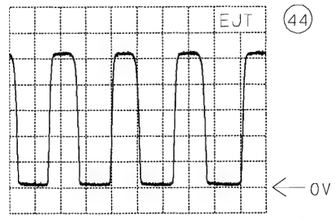
A: DC, 1 V/Div, 10us/Div
IC 7410 Pin 15



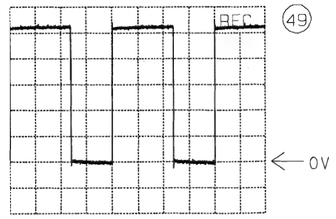
A: DC, 1 V/Div, 5ms/Div
Connector 1913 Pin 12



A: DC, 500mV/Div, 500us/Div
IC 7411 Pin 8



A: DC, 1 V/Div, 10ms/Div
Connector 1913 Pin 11



A: DC, 1 V/Div, 10ms/Div
IC 7411 Pin 2

OIO Board, In/Out - Part

TO/FROM OIO-VS

VBS CSYNC FMPV CSR CSI CSP

pin10 red green blue 8SC2 VIN2 AIN2R AOUT2R AIN2L AOUT2L

MON VFV VIN1

VOUT2

SCART 2
SCRAMBLE
1954

VideoIn VideoOut red/c green blue blanking Swtching AudInL AudOutL AudInR AudOutR

6565 BZX84-C6V8 GNDA
3931 0E not used
not used 6566 BZX84-C6V8 GNDA
3589 8k2
3590 2k2 GNDA
6550 BZX79-C12 -7V
3550 75E GNDA

6560 BZX79-C12 -7V
6561 BZX79-C12 -7V GNDA
6562 BZX79-C12 -7V GNDA
6563 BZX79-C12 -7V GNDA

3570
2570 470p GNDA
6570 BZX79-C12 -7V
3587 0E for MONO only

3571
3588 0E for MONO only
2571 470p GNDA
6571 BZX79-C12 -7V
3572 220k for STEREO only GNDA

3584 100E
2580 470p GNDA
6580 BZX84-C12 -7V
for STEREO only

3591 0E for STEREO only
2581 10u
3581 100k GNDA
3582 4k7 -7V
for MONO only

3593 GNDA
3586
2540 470p GNDA
6540 BZX79-C12 -7V

6590 BZX79-C18 GNDA
6564 BZX79-C18 GNDA

5VAS
3585 4k7
0,3V
7550 BC818-40
0,1V
0,1V
3551 6k8

for FOME only
3930 0E

VFV AOUT2R AIN2R AOUT2L AIN2L blue pin10 green 8SC2 red BLANKING VIN2 VOUT2 MON VIN1 VBS FOME CSYNC FMPV CSP CSI CSR

BLANKING

FOLLOW-ME - OPTION

5VAS
3866 4M7
3850 15k 0V
3851 10k 0V
2850 10u
3852 10k GNDA
2853 560p GNDA
2852 4n7 GNDA
LM339N 7850 -4C
3856 2k2
3858 2k2
1.7V
3857 4k7
BC848B 7851
3865 4k7
BC848B 7852

3867 4M7
2851 10u
3854 15k 0V
3855 10k 5.1V
1.6V
3853 10k GNDA
2855 560p GNDA
2854 4n7 GNDA
LM339N 7850 -4D

7850 LM339N -4A
0V

3860 4k7
3861 22k
5.13V
2860 100n GNDA
3864 4k7
2.3V
0.3V
3859 0E
5.0V
FOME
LM339N 7850 -4B
3863 100k
2858 10u GNDA
3862 15k GNDA

Pos.	MONO	STEREO
3570	6k8	0E
3571	6k8	0E
3586	470E	100E
3593	100k	220k

...V MEASURED IN PLAYBACK-MODE AND BOTH SCART-PLUGS CONNECTED TO 75-Ohm LOAD (VIDEO)

3-16

MON
VFV
VIN1

5VAS
3866 4M7
3850 15k
3851 10k
3852 10k
2850 10u
2853 560p
2852 4n7
0V
10
11
13
1.7V
LM339N
7850 -4C
3856 2k2
3858 2k2
3857 4k7
BC848B
7851
3865 4k7
BC848B
7852
3859 0E
0.3V
3860 4k7
3861 22k
5.13V
2.3V
2860 100n
3864 4k7
5
4
3
2
5.0V
12
LM339N
7850 -4B
3863 100k
2858 10u
3862 15k
FOME
GNDA

5VAS
3867 4M7
2851 10u
3854 15k
3855 10k
3853 10k
2855 560p
2854 4n7
0V
8
9
14
5.1V
1.6V
LM339N
7850 -4D

5VAS
3585 4k7
0,1V
3551 6k8

7850
LM339N -4A
7
6
1
0V

FOLLOW-ME - OPTION

BLANKING

for FOME only
3930 0E

VFV
AOUT2R
AIN2R
GNDA
AOUT2L
AIN2L
blue
pin10
green
8SC2
red
BLANKING
VIN2
5VAS
VOUT2
GNDA

1951
1 AOUT2R
2 AIN2R
3 GNDA
4 AOUT2L
5 AIN2L
6 blue
7 pin10
8 green
9 8SC2
10 red
11 BLANKING
12 VIN2
13 5VAS
14 VOUT2
15 GNDA

TO FAMILY-BOARD OFB-I/O
Connector 1591-A

1952
1 GNDA
2 MON
3 VIN1
4 -7V
5 VBS
6 GNDA
7 FOME
8 5VPB
9 CSYNC
10 GNDVS
11 FMPV
12 GNDVS
13 CSP
14 CSI
15 CSR

MON
GNDA
VIN1
-7V
VBS
FOME
GNDA
5VPB
CSYNC
GNDVS
FMPV
GNDVS
CSP
CSI
CSR

for SECAM-L only

TO FAMILY-BOARD OFB-I/O
Connector 1591-B

1951 A21
1952 E21
1954 E 1
2540 I 5
2570 H 2
2571 J 3
2580 K 2
2581 E 7
2850 D10
2851 F10
2852 E12
2853 E11
2854 F12
2855 F11
2858 F15
2860 D17
3550 E 4
3551 H 9
3570 H 4
3571 I 4
3572 J 4
3581 F 6
3582 F 7
3584 J 3
3585 G 9
3586 H 5
3587 H 4
3588 J 2
3589 D 3
3590 D 4
3591 E 5
3593 H 5
3850 D11
3851 D11
3852 E11
3853 F11
3854 F11
3855 F11
3856 D13
3857 D13
3858 D13
3859 E15
3860 D15
3861 D15
3862 F15
3863 E17
3864 D17
3865 E13
3866 D11
3867 E11
3930 A19
3931 C 3
6540 I 5
6550 E 4
6560 F 3
6561 F 4
6562 G 4
6563 G 4
6564 H 7
6565 C 2
6566 D 2
6570 H 3
6571 J 3
6580 K 2
6590 H 6
7550 H 8
7850 E16
7850 F14
7850 F12
7850 D12
7851 D14
7852 E14

PB (14)
0V
A: DC, 1 V/Div, 20us/Div
IC 7051 Pin 14

REC (60)
0V
A: DC, 500mV/Div, 20us/Div
Connector 1952 Pin 5

REC (62)
0V
A: AC, 50mV/Div, 50us/Div
IC 7151 Pin 29

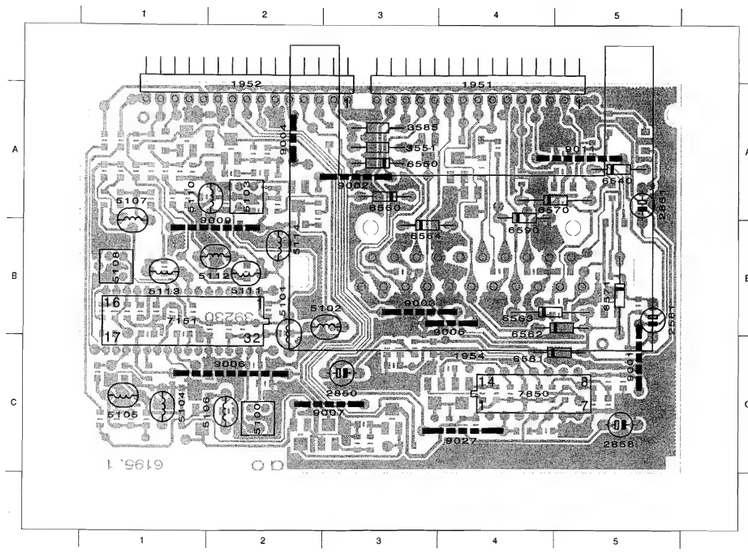
PB (63)
0V
A: AC, 50mV/Div, 20us/Div
IC 7151 Pin 23

STP (64)
0V
A: AC, 200mV/Div, 20us/Div
IC 7151 Pin 18

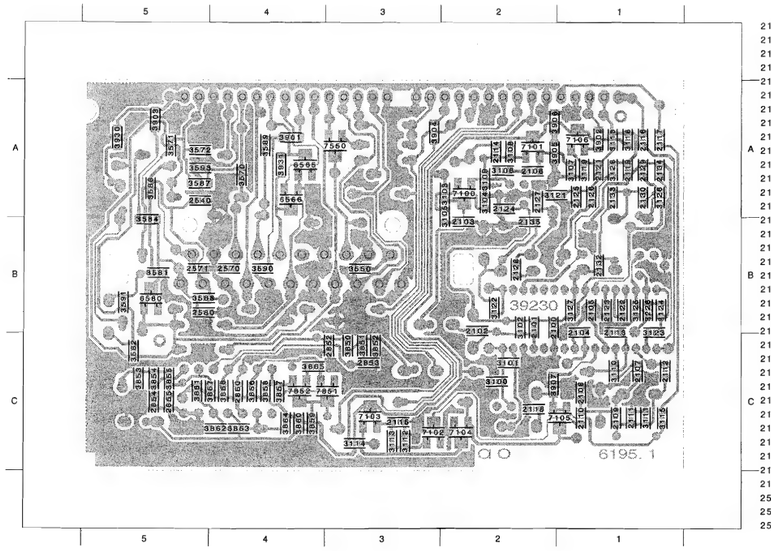
:K-MODE AND BOTH SCART-PLUGS CONNECTED TO 75-Ohm LOAD (VIDEO)

OIO (...3923.3)
I/O-ECO

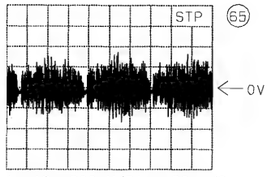
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
A B C D E F G H I J K



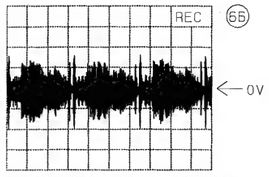
1951 A 4 9003 B 3
1952 A 2 9004 A 2
1954 B 4 9005 B 4
2581 B 5 9006 C 2
2850 C 3 9007 C 3
2851 A 5 9009 B 2
2858 C 5 9011 A 5
3551 A 3 9027 C 4
3585 A 3
A 5100 C 2
5101 B 2
5102 B 3
5103 A 2
5104 C 1
5105 C 1
5106 C 2
5107 B 1
5108 B 1
B 5110 A 2
5111 B 2
5112 B 2
5113 B 1
5114 B 2
6540 A 5
6550 A 3
6560 A 3
6561 C 5
C 6562 B 5
6563 B 4
6564 B 3
6570 A 5
6571 B 5
6590 A 4
7151 B 1
7850 C 4
9001 C 5
9002 A 3



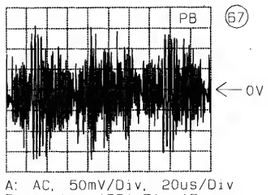
2100 B 2 2580 B 5 3572 A 5 3931 A 4
2101 B 2 2852 C 3 3581 B 5 6565 A 4
2102 B 2 2853 C 3 3582 C 5 6566 A 4
2103 B 2 2854 C 5 3584 B 5 6580 B 5
2104 B 1 2855 C 5 3586 A 5 7100 A 2
2105 B 1 2860 C 4 3587 A 5 7101 A 2
2106 A 2 3100 C 2 3588 B 5 7102 C 3
2107 C 1 3101 C 2 3589 A 4 7103 C 3
2108 C 1 3102 B 2 3590 B 4 7104 C 2
A 2109 C 1 3103 A 2 3591 B 5 7105 C 1
2110 C 1 3104 A 2 3593 A 5 7106 A 1
2111 C 1 3105 A 2 3850 C 3 7550 A 3
2112 C 1 3106 A 2 3851 C 3 7851 C 3
2113 B 1 3107 A 1 3852 C 3 7852 C 4
2114 A 2 3108 A 2 3853 C 5
2115 C 3 3109 A 2 3854 C 5
2116 A 1 3110 C 1 3855 C 5
2117 A 1 3111 C 1 3856 C 4
B 2118 C 2 3112 C 3 3857 C 4
2119 A 1 3113 C 3 3858 C 4
2121 A 1 3114 C 3 3859 C 4
2122 B 1 3115 C 1 3860 C 4
2123 B 1 3116 A 1 3861 C 5
2124 A 2 3118 A 1 3862 C 4
2125 A 1 3119 A 1 3863 C 4
2126 A 1 3121 A 1 3864 C 4
2127 A 2 3122 B 2 3865 C 4
C 2128 B 2 3123 B 1 3866 C 4
2129 A 1 3124 B 1 3867 C 4
2130 A 1 3125 B 1 3901 A 4
2132 B 1 3126 A 1 3902 A 1
2133 A 1 3127 B 1 3903 A 5
2134 A 1 3128 A 1 3904 A 3
2135 B 2 3226 B 1 3905 A 2
2540 A 5 3550 B 3 3906 A 2
2570 B 4 3570 A 4 3907 C 2
2571 B 5 3571 A 5 3930 A 5



A: AC, 200mV/Div, 20us/Div
IC 7151 Pin 1

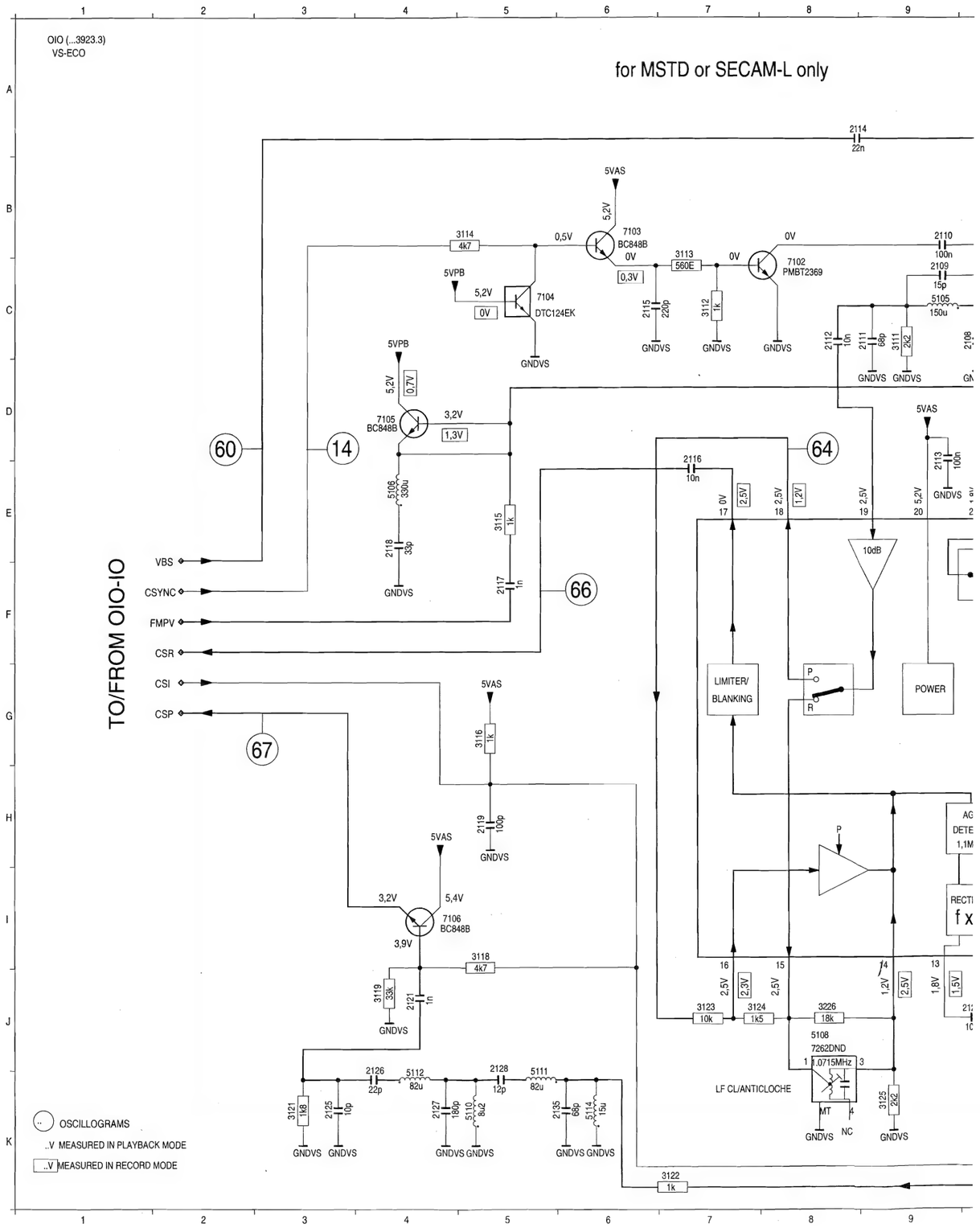


A: AC, 200mV/Div, 20us/Div
IC 7151 Pin 17



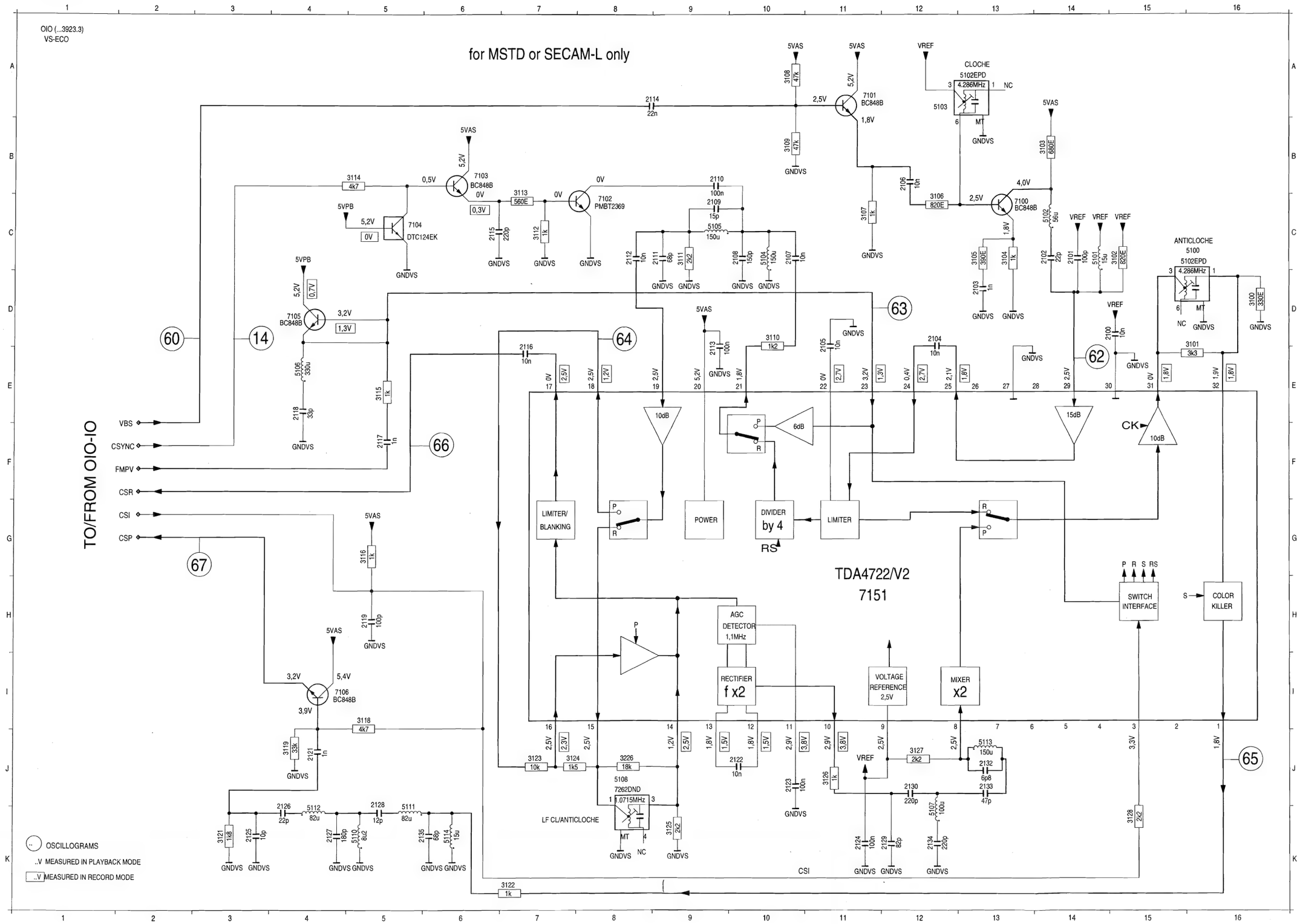
A: AC, 50mV/Div, 20us/Div
Connector 1591 Pin 13

OIO Board - VS-Part

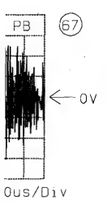


3-17

OIO Board - VS-Part



A 5 3931 A 4
B 5 6565 A 4
C 5 6566 A 4
B 5 6580 B 5
A 5 7100 A 2
A 5 7101 A 2
B 5 7102 C 3
A 4 7103 C 3
B 4 7104 C 2
B 5 7105 C 1
A 5 7106 A 1
C 3 7550 A 3
C 3 7851 C 3
C 3 7852 C 4
C 5
C 5
C 4
C 4
C 4
C 4
C 4
C 5
C 4
C 4
C 4
C 4
C 4
C 4
A 4
A 1
A 5
A 3
A 2
A 2
C 2
A 5

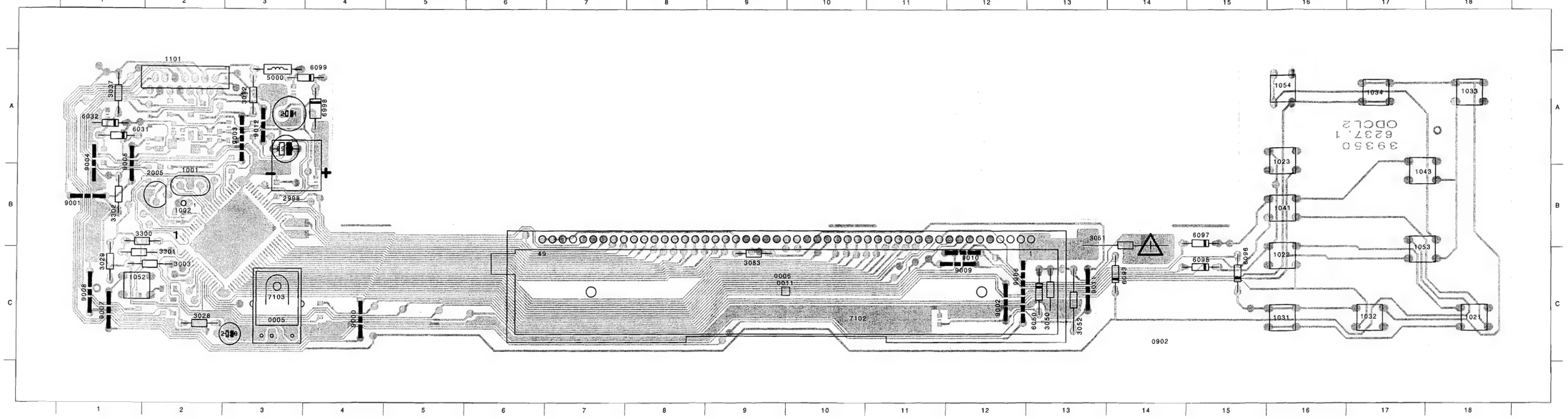


2100 D15
2101 C14
2102 C14
2103 D13
2104 D12
2105 D11
2106 B12
2107 C10
2108 C10
2109 C9
2110 B9
2111 C9
2112 C8
2113 E9
2114 A9
2115 C6
2116 E7
2117 F5
2118 E4
2119 H5
2121 J4
2122 J10
2123 J10
2124 K11
2125 K3
2126 K4
2127 K4
2128 K5
2129 K12
2130 J12
2132 J13
2133 J13
2134 K12
2135 K6
3100 D16
3101 E16
3102 C15
3103 B14
3104 C13
3105 C13
3106 C12
3107 C11
3108 A10
3109 B10
3110 D10
3111 C9
3112 C7
3113 C7
3114 B5
3115 E5
3116 G5
3118 I5
3119 J4
3121 K3
3122 K7
3123 J7
3124 J7
3125 K9
3126 J11
3127 J12
3128 K15
3226 J8
5100 C16
5101 C14
5102 C14
5103 A12
5104 C10
5105 C9
5106 E4
5107 K12
5108 J8
5110 K5
5111 J5
5112 K4
5113 J13
5114 K6
7100 C13
7101 A11
7102 C8
7103 B6
7104 C5
7105 D4
7106 I4
7151 H11

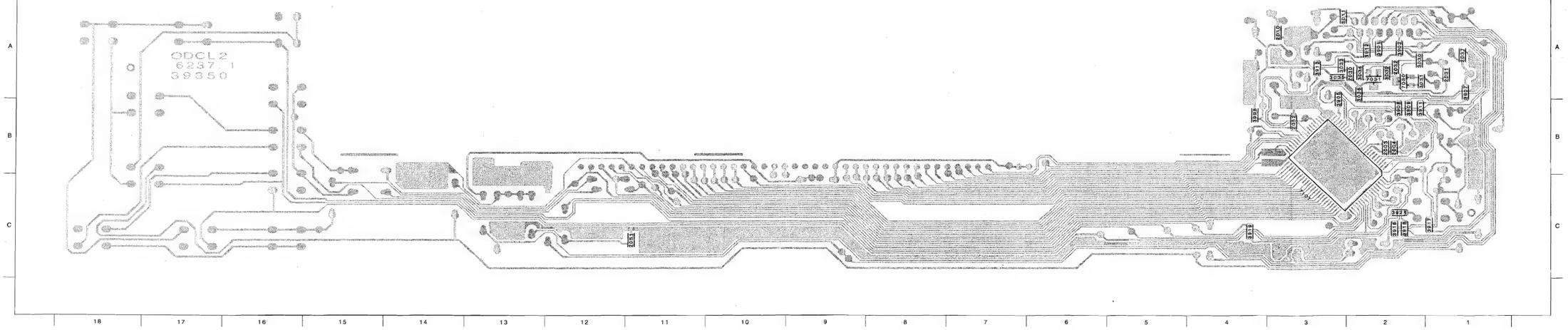
3-18

Operating Panel ODCL2

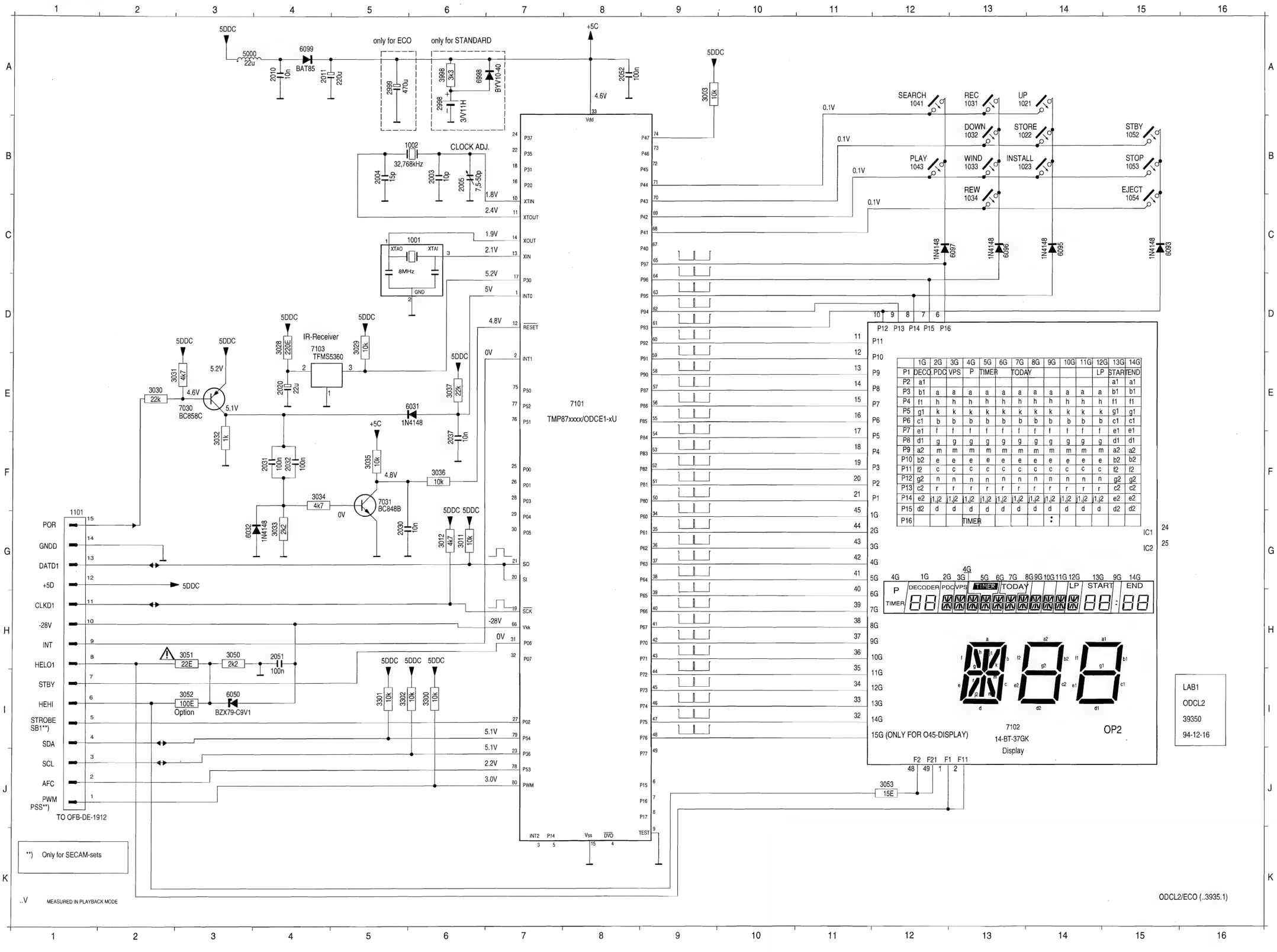
0005 C 3 0902 C 13 1021 C 18 1031 C 16 1034 A 17 1052 C 1 1101 A 2 2020 C 3 3003 C 2 3029 C 1 3051 B 14 3300 B 1 5000 A 3 6050 C 13 6096 C 15 6998 A 4 9000 C 4 9003 A 3 9006 C 12 9009 C 12 9012 A 3
0006 B 13 1001 B 2 1022 C 16 1032 C 17 1041 B 16 1053 C 17 2005 B 2 2998 B 3 3012 A 3 3037 A 1 3052 C 13 3301 C 1 6031 A 1 6093 C 14 6097 B 15 7102 B 9 9001 B 1 9004 A 1 9007 C 1 9010 C 12
0011 C 9 1002 B 2 1023 A 16 1033 A 18 1043 B 17 1054 A 16 2011 A 3 2999 A 3 3028 C 2 3050 C 13 3053 C 9 3302 B 1 6032 A 1 6095 C 15 6099 A 4 7103 C 3 9002 C 12 9005 A 1 9008 C 1 9011 C 13



2003 B 2 2010 A 3 2031 A 1 2037 A 1 2052 B 3 3030 A 2 3032 A 2 3034 A 2 3036 A 2 3902 A 2 3907 A 1 3909 B 2 3912 A 2 3916 C 2 3918 C 2 3921 C 2 7030 A 2 7101 B 3
2004 B 2 2030 A 2 2032 A 2 2051 C 11 3011 A 3 3031 A 2 3033 A 3 3035 A 3 3901 A 2 3905 A 3 3908 B 2 3911 B 2 3913 A 3 3917 C 1 3919 C 4 3998 B 4 7031 A 2



Operating Panel ODCL2



1001 C 6
1002 B 6
1021 A13
1022 B13
1023 B13
1031 A13
1032 B13
1033 B13
1034 C13
1041 A12
1043 B12
1052 B15
1053 B15
1054 C15
1101 G 1
2003 B 6
2004 B 5
2005 B 6
2010 A 4
2011 A 4
2020 E 4
2030 G 5
2031 F 4
2032 F 4
2037 F 6
2051 H 4
2052 A 8
2998 A 6
2999 A 5
3003 A 9
3011 G 6
3012 G 6
3028 D 4
3029 D 5
3030 E 2
3031 E 3
3032 F 3
3033 G 4
3034 F 4
3035 F 5
3036 F 6
3037 E 6
3050 H 3
3051 H 3
3052 I 3
3053 J12
3300 I 6
3301 I 5
3302 I 5
3998 A 6
5000 A 3
6031 E 6
6032 G 3
6050 I 3
6093 C15
6095 C14
6096 C13
6097 C13
6099 A 4
6998 A 6
7030 E 3
7031 F 5
7101 E 8
7102 I13
7103 D 4

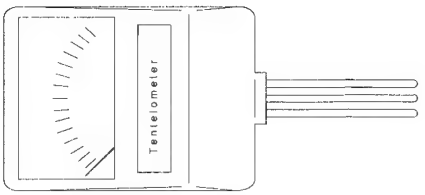
4. DRIVE ASSEMBLY

This tape deck has three motors; one providing precision drive for the scanner unit; the second providing direct drive for the capstan and belt drive for the reel tables; the third motor drives the lift and tape threading/dethreading operations.

Special features are:

Quick start
Short winding time
Automatic cleaning of video heads by cleaning roller

To obtain a high repair standard we have developped a range of service kit's. These kit's covers the spare parts which are engaged together.



Tentelometer

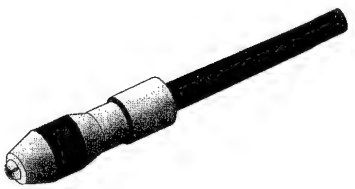
Tool for tapetension adjustment

4.1 Deck parts replacement

Before repairing a deck assembly the top and bottom covers should be removed.
The procedure for the removal and refitting of the following parts is described; only the lift, the scanner, the capstan motor and the A/C head are fixed by screws.
All the other deck assembly parts are held only by snap hooks.

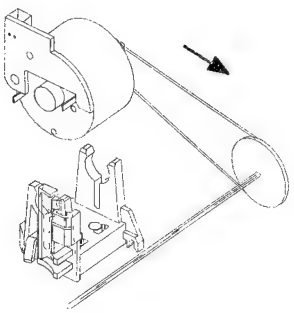
Manual extraction of cassette:
If, after the Eject button has been pressed, the drive does not unthread and eject the cassette, the dethreading/eject operation can also be carried out manually by turning the wheel at the rear of the threading motor.

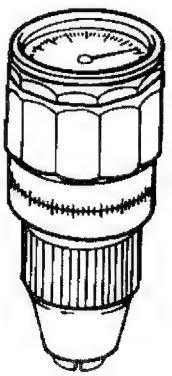
To avoid slack tape, alternate this action with the movement of the capstan motor (counter-clockwise), until the tape is completely taken into the cassette.



Handle

Fig. 1





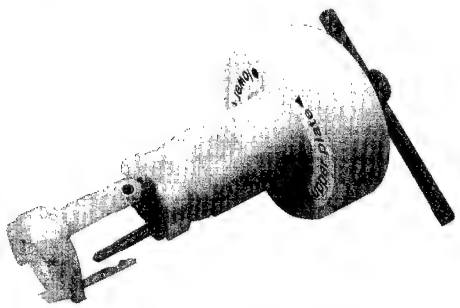
Torquemeter:

600 gf-cm
90 gf-cm

IMPORTANT:
After each repair has been carried out in the drive assembly, the first operation after repairing must be to bring the cassette compartment into "eject" position by hand.

Auxiliary tools for deck adjustment:

Post adjustment screwdriver



Tool for removing the head disc

Testcassette

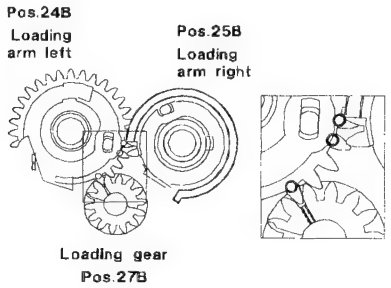
Nylon gloves

4.1.1 Deck lay out diagram

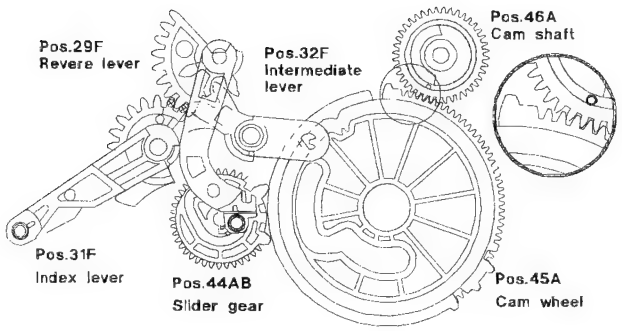
Deck in position "threaded out".

The following diagrams indicate the relative position of the gearwheels and levers when the deck is in the threaded out (cassette compartment down) position.

Top view



Top view



4.1.2 The Lift

Refitting the lift compartment:
Ensure the lift compartment is down and gear A is rotated one click stop anticlockwise from the down position.
The removal and refitting of the lift can be carried out in all deck positions with the exception of "eject" (ensure that gears 103/105 are free).

To remove the lift
- Free the holding bracket (Fig. 2) by rotating it up and back from the upper end.
- Unscrew the 4 screws on the underside of the deck.
- Carefully remove the lift vertically, noting the position of the record protect operating lever.

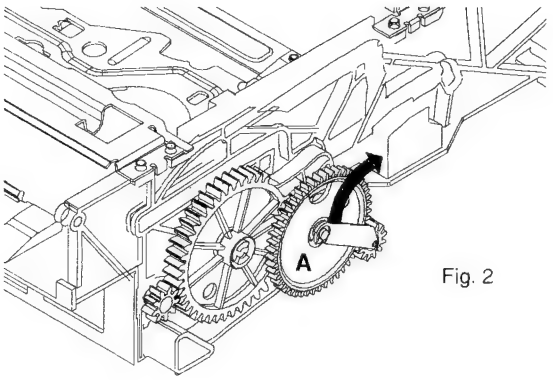
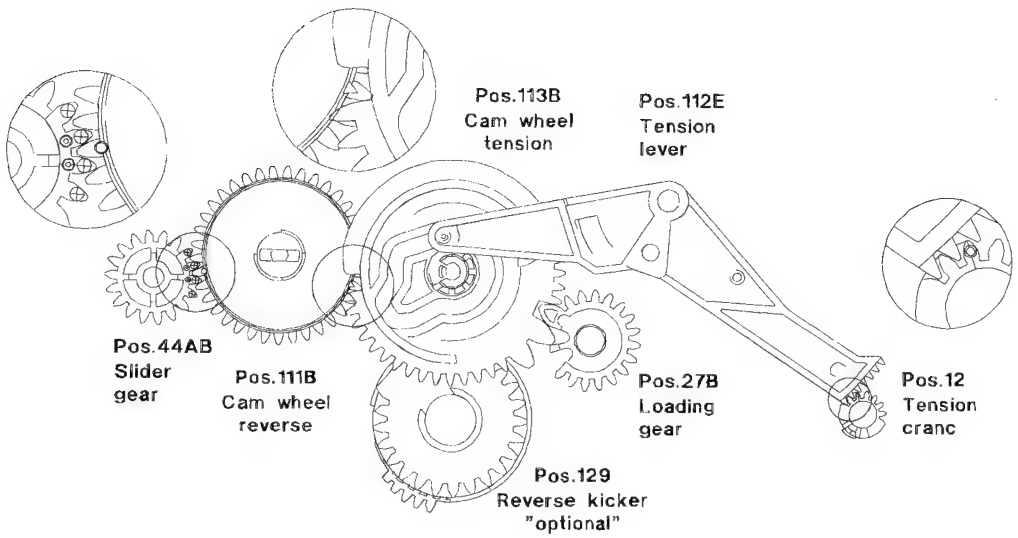


Fig. 2

Underside view



4.1.3 Head disc replacement

Removal :

- Nylon gloves should be worn when handling the head disc.
- Turn the headdisc until the long hole of the rotor appears in the bigger hole of the scannermotor
- Insert the reference pin C (included with each service head disc) through the bigger hole of the lid of the scanner motor until the pin snaps in the long hole of the rotor. (Fig. 3)

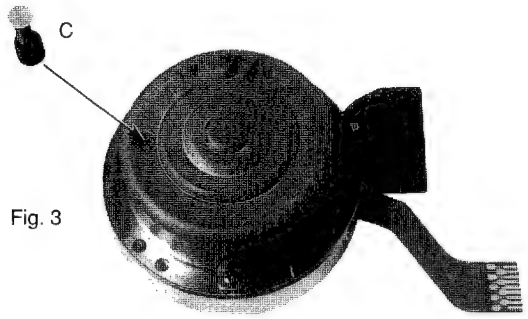


Fig. 3

Important:
Choose Installation/Removal of the upper/lower clamping element by turning and attaching the reference element to the tool. (Fig. 4)

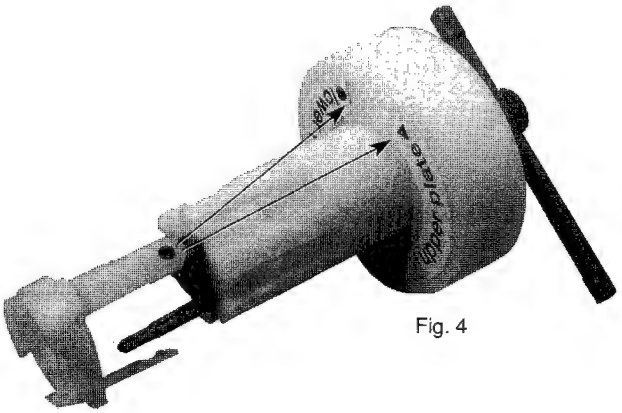


Fig. 4

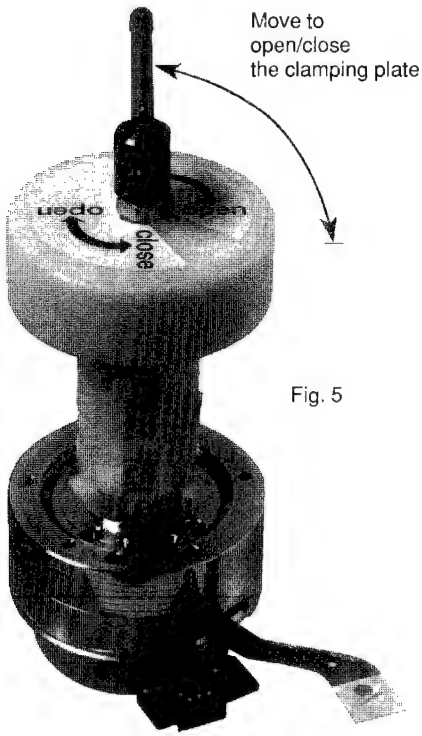


Fig. 5

- Position the tool on the upper clamping element, loosen the clamping element by turning the lever 90 degrees and remove it from the head disc. (Fig. 5)
- Prepare the tool for the lower clamping element.Position the tool on the head disc and make sure that all 3 pins are snapped in the the lower clamping element. Loosen the clamping element by turning the lever 90 degrees and remove the head disc plus the tool from the scanner spindle. (Fig.6)

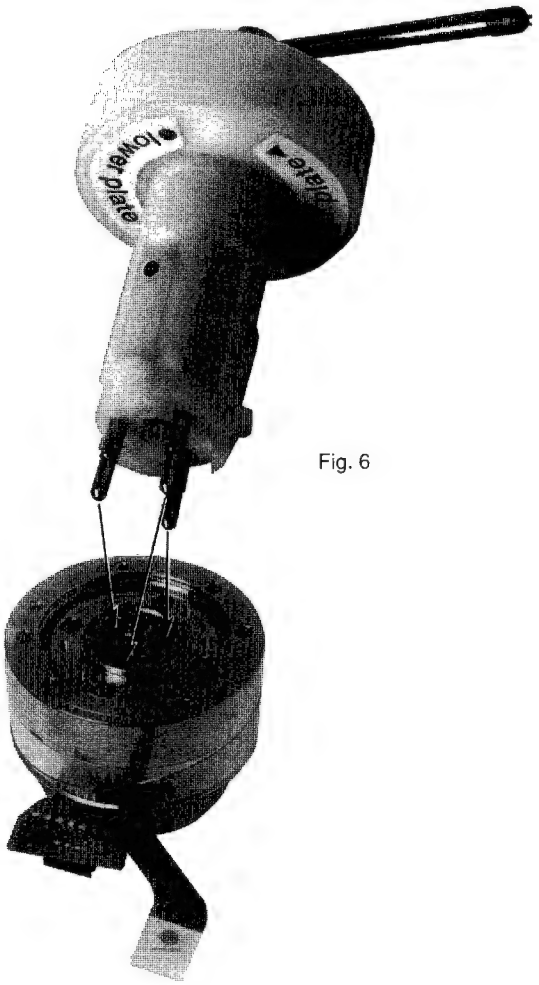


Fig. 6

Installation:

- Before carrying out the installation of the new head disc make sure that the scanner motor spindle is clean and undamaged. (The spindle has to be free of grease and must not be touched with bare hands)
- Insert the 2 Mylar foils (included with each head disc) in the head disc. (Fig.7)

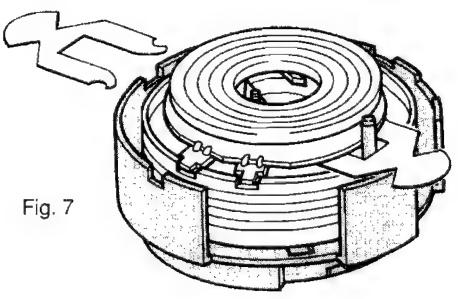


Fig. 7

- Position the tool (reference: lower clamping element) on the new headdisc (with protective cover) and loosen the lower clamping element.
- Position the head disc so that pin D of the protective cover engages in the hole of the stator (the arrow on the protective cover must point towards the scanner print). (Fig. 8)

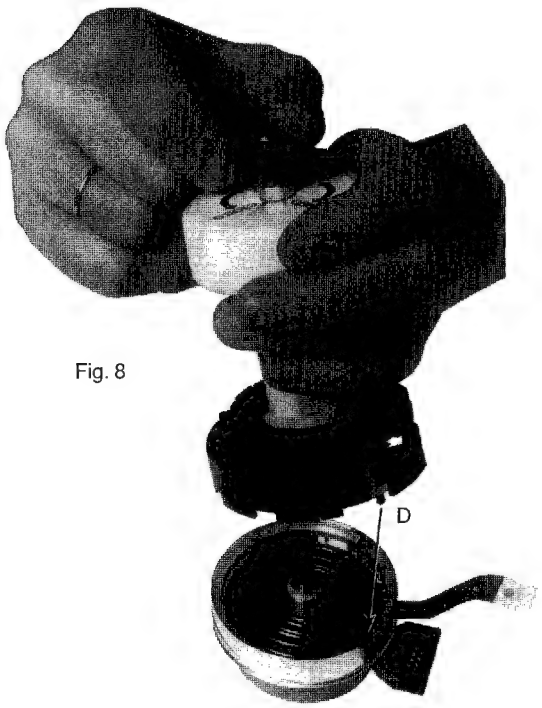
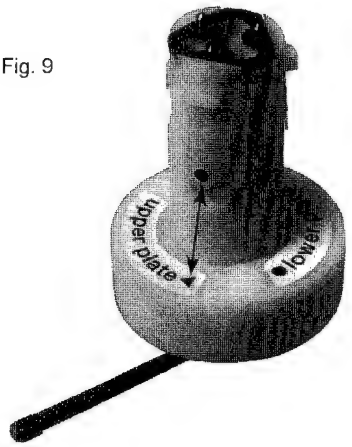


Fig. 8

- Reach the exact position through pressing the tool down with a force of 1 N. and fix the lower clamping element by turning the lever towards "close".
- Remove the tool.
- Change the tool to "upper clamping element" and position the clamping element exactly. (Fig. 9)

Fig. 9



- Tighten the clamping element through turning the lever towards "open".
- Position the tool planely on the head disc and fix the clamping element. (Fig.5 "close")
- Remove the protecting cap from the head disc, withdraw the two Mylar foils and remove the reference pin C.

After replacing the head disc, carry out the following adjustments and checks :

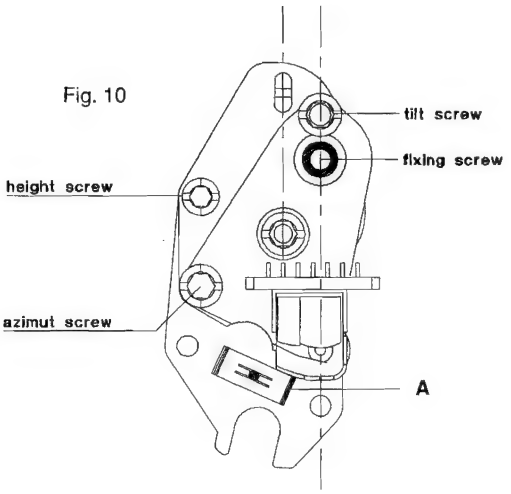
- Head switching pulse (gap position, chapter 3)
- Write current adjustments (chapter 3)
- Check tape path alignment. (see paragraph 4.2.1.)

4.1.4 A/C Head (Combi head) (Pos. 36)

- Remove fixing spring (A) (Fig. 10).
- Remove the fixing screw and replace the A/C head.
- Use a new fixing spring (included with new A/C head) for reassembly.

After the A/C head has been replaced, all adjustments described in paragraph 4.2.1.2 and paragraph 4.2.1.3 have to be carried out.

Fig. 10



4.1.5 Threading motor (Pos. 38)

- Remove the belt and disconnect the connector plug.
- Remove the threading motor from the motor supports (Fig. 11).

During reassembly ensure that the threading motor is correctly located in the front and rear supports.

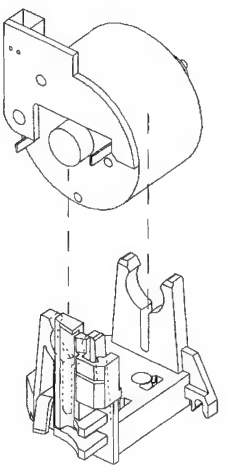


Fig. 11

4.1.6 Capstan motor (Pos. 127)

- Set the drive assy to "Eject" position.
- Remove the belt (pos.126) on the underside; then free the pin from the sensor print (see section 4.1.10). Lift sensor print part vertically (it is plug and socket connected to the capstan motor print). Move both sections of the sensor print clear of the capstan motor.
- Remove the three capstan motor fixing screws (Fig. 12) and withdraw the capstan motor downward from the drive assy.

The reassembly is carried out in reverse order. Make sure that the capstan is free of grease.

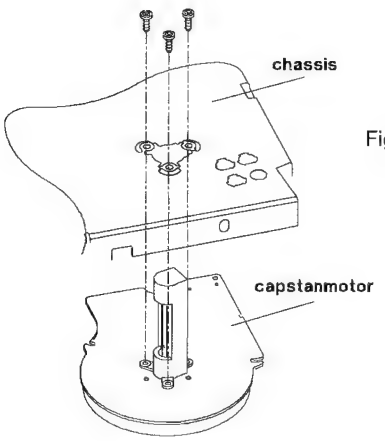


Fig. 12

4.1.7 Pressure roller (Pos. 37)

- Set the drive assy to "Eject" position.
- Unhook and remove the pressure roller tension spring.
- Release the pressure roller guide (pos. 41G) from the guide in the threading motor holder by pressing the top of the motor guide rearwards and rotating the pressure roller guide assembly clockwise by approximately a quarter of a turn.(see Fig. 13) The pressure roller and guide can now be lifted clear.

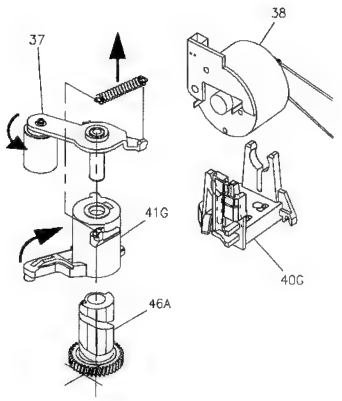
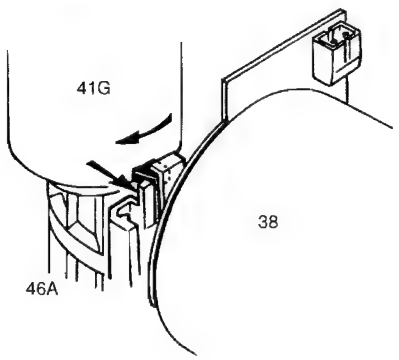


Fig. 13



Ensure that no grease from the pressure roller guide gets to the capstan or pressure roller.
The reassembly is carried out in reverse order.

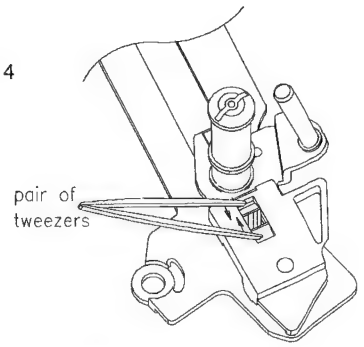
4.1.8 Roller unit right (Pos. 26)

- Set the drive assy to "Eject" position.
- Compress the two snap hooks by means of a pair of tweezers and remove the roller assy from the roller unit right (Fig. 14).
- Unhinge the loading arm right from the holding plate and push the latter towards the front of the deck to remove from the guide (right).

NOTE: During reassembly ensure the link from 25B is engaged in the hole of the holder plate 26

After replacing the roller unit (right), the tape path has to be checked, and adjusted if necessary (paragraph 4.2.1).

Fig. 14



4.1.9 Roller unit left (Pos.23)

- Set the drive assy to "Eject" position.
- Unhook the tension arm spring (pos. 11), to avoid the tension arm spring being pre-loaded.
- At the bottom side of the drive assy, partially unhinge the sensor mounting print and remove the tension lever (pos.112).
- Compress the two snap hooks by means of a pair of tweezers (Fig. 9)and remove the roller assy (A) from the plate (B).
- Unhinge the loading arm (left) from the holding plate and remove the latter downward from the drive assy through the recess in the chassis (Fig. 15).

The reassembly is carried out in reverse order.

NOTE: During reassembly
1. Place the carriage holding plate in the assembly with the half-round cutout nearest the rear of the deck.
2. When the loading arm is refitted ensure the pin on the underside of 23 is through the link of 24B.

After replacing the roller unit (left) the tape path has to be checked (paragraph 4.2.1.), and adjusted if necessary.

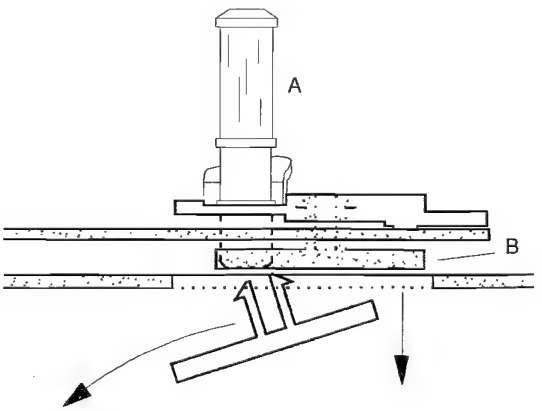


Fig. 15

4.1.10 Sensor print assy (Pos. 118)

For circuit diagram and electrical data see deck electronics (chapter 3).
If a part of the sensor print is defective the whole sensorprint has to be replaced.
Proceed as follows:
- Remove the deck assembly from the set.
- Lift the sensor print vertically, it is plug and socket connected to the capstan motor print.
- All other parts are attached by means of snap hooks and are easily freed.

Reassembly is carried out by snapping the snap hooks into place, and inserting the rivet B.

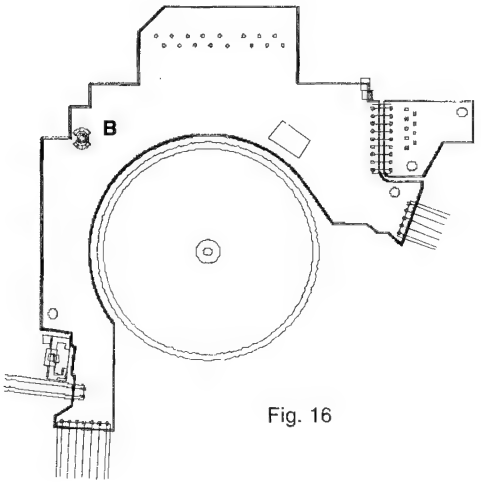
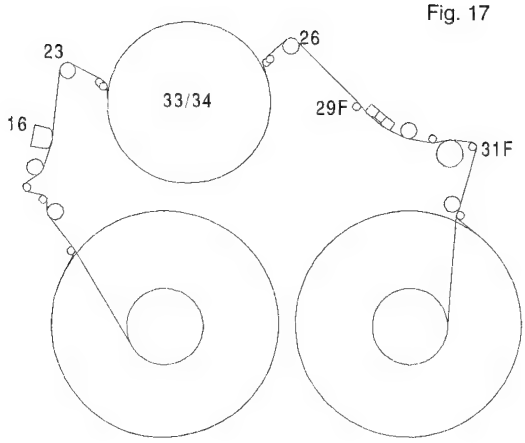


Fig. 16

4.2 Adjustments

4.2.1 Tape path

Fig. 17



4.2.1.1 Roller left unit/roller unit right

Preparation:
- Connect one input of a dual trace oscilloscope to observe the tape sync pulse CTL.The other input (DC coupled) to observe the tracking information TRIV.
- Trigger the oscilloscope externally on the head pulse HP1.
- Playback the black and white section of the alignment test tape.
- Set the deck in the condition where the video heads are running along the upper edge of the tracks only by:

1. Press the tracking button.
2. Move the tape sync pulse, in relation to the head pulse, to the left by pressing the +/- button.
3. Stop this movement when a noisy picture (disturbances) is visible on the TV set and the CTL pulse is on the left of the display.

The machine will retain this position in memory until a cassette is inserted once again.
This condition works only if X-distance is adjusted.

Adjustment:
Adjust the left and right roller units to make the tracking signal TRIV straight and flat as possible (Fig. 18).

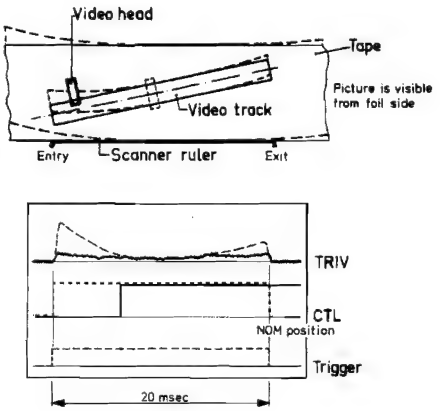


Fig. 18

4.2.1.2 A/C Combi head

Tilt angle adjustment

- Set the drive to feature mode (e.g. +7)

Adjustment **with** tape guide A1:
- By means of the tilt angle adjusting screw move the tape until the lower edge just touches the tape guide A1 (see Fig. 19) the tape must not be distorted at the lower edge (by pressing onto guide).

Adjustment **without** tape guide A1:
- By means of the tilt angle adjustment screw move over the tape until the lower edge just touches the tape guide A2 (see fig.19) (by pressing onto guide).After that turn the tilt angle adjustment screw anticlockwise for 60°- 90° (The tape must not touch guide A2).

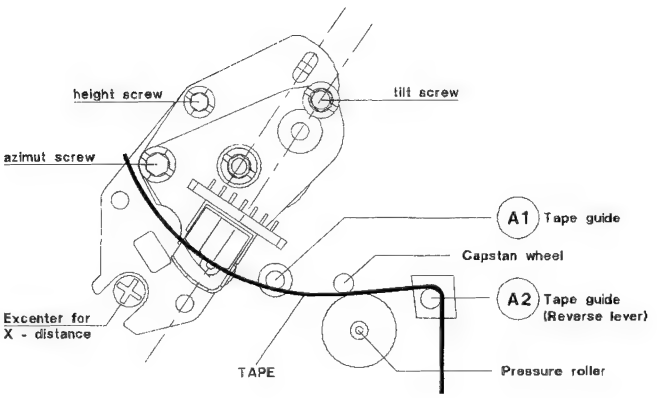


Fig. 19

Adjustment of the azimuth angle and the head height

- Connect an oscilloscope to the linear Audio output.
- Play the section of the test cassette with the audio signal 400 Hz.
- Adjust for maximum output voltage by means of the height adjustment screw
- Play the section of the test cassette with the audio signal 8 kHz.
- Adjust to maximum output voltage by means of the azimuth adjustment screw (Fig. 19).
- If necessary, repeat this procedure
- Check the tilt angle adjustment

If the tape path was completely out of adjustment or if several components in the tape path have been replaced, it is possible, that the adjustments described in paragraph 4.2.1.1 and paragraph 4.2.1.2 have to be repeated several times.

4.2.2 Adjustment of the horizontal distance (x-distance)

- Before this adjustment is carried out, insert the test cassette (start from Eject position). Call the service test program (tracking value will take up its nominal position) and press the "play" button.
- Playback the black/white part of the test cassette.)
- Display the TRIV signal on an oscilloscope (DC-coupled) and adjust for maximum voltage by means of the eccentric screw (Fig.19).

4.2.3 Brake band adjustment

- Set the drive to "Play"
- Adjust the brake band by means of adjusting tool (from the underside of the drive), until the edge of the elbow of the tape tension arm overlaps with the left inner edge of the left guide by 0.5mm (see Fig. 20)

4.2.4 Tape tension adjustment

- Play a VCR cassette (E 180) starting from the beginning of the tape.
- Measure the tape tension before the roller unit left by means of a tentelometer.
- Adjust the tension arm spring (pos.11) to a tape tension of 0,24 N ± 0,02 N (24 g ±2 g) by means of the adjustment tool (from the underside of the drive, Fig. 20).

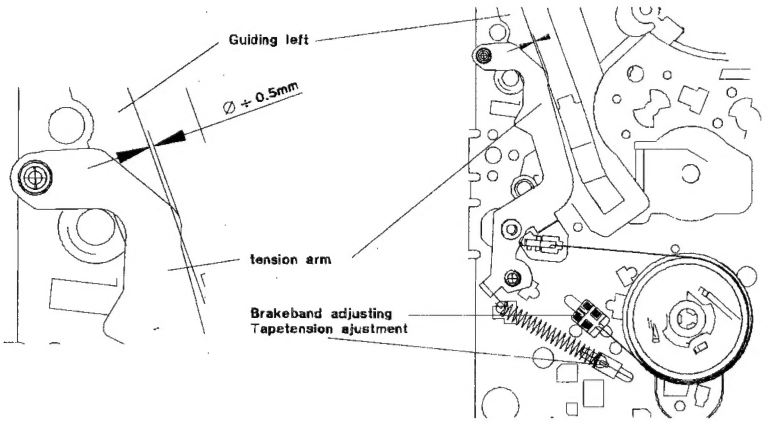
4.2.5 Friction clutch control check

- Set the drive to "Play" position.
- Place the torquemeter on the right reel.
- Turn the capstan motor to move the right reel clockwise.
- Keep turning, until the indication at the torquemeter no longer changes (Fig. 21)
- The torque has to be 10,5 mNm ± 25% (105gFcm ±25%)

4.2.6 Reverse brake control

- Set the drive to "Reverse" position.
- Place a torquemeter on the right reel and turn the latter counterclockwise, until the reel just starts to flip.
- The value indicated at the torquemeter has to be 7mNm± 3mNm (70 gFcm ± 30gFcm) (Fig. 21).

Fig. 20



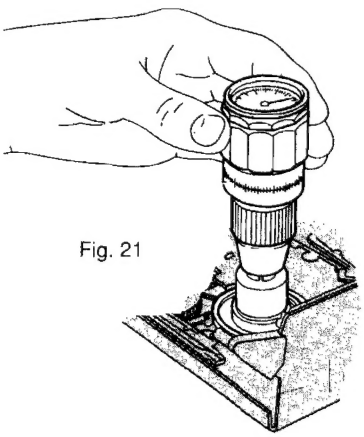
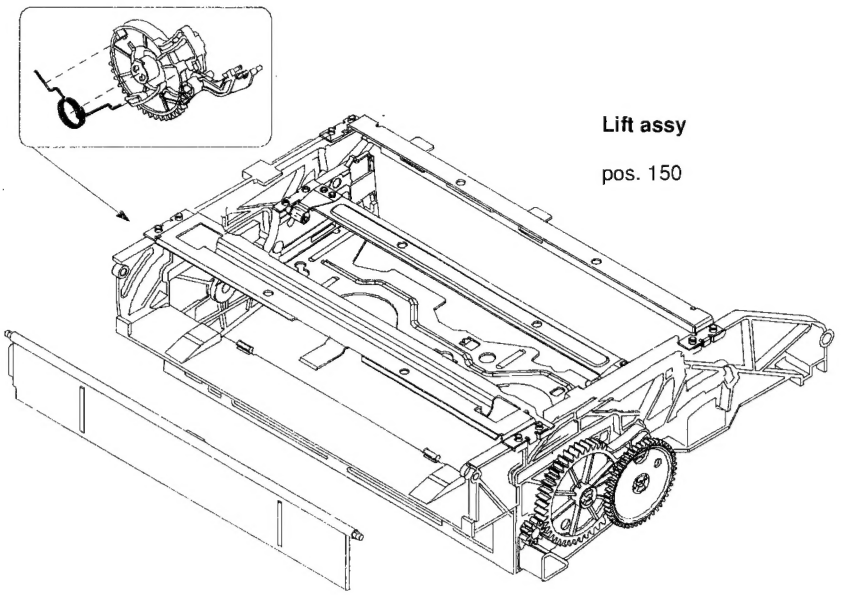


Fig. 21

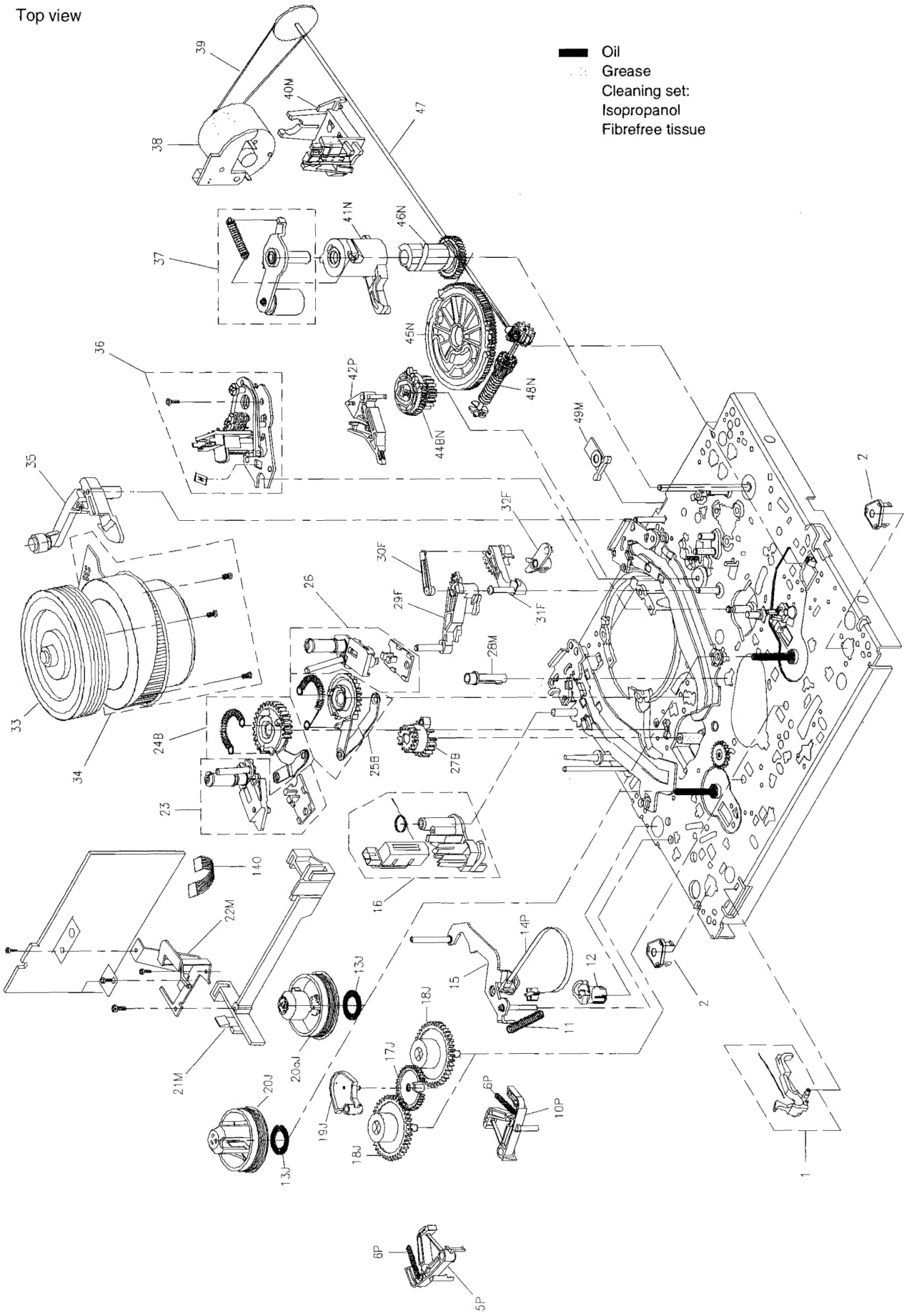


Lift assy

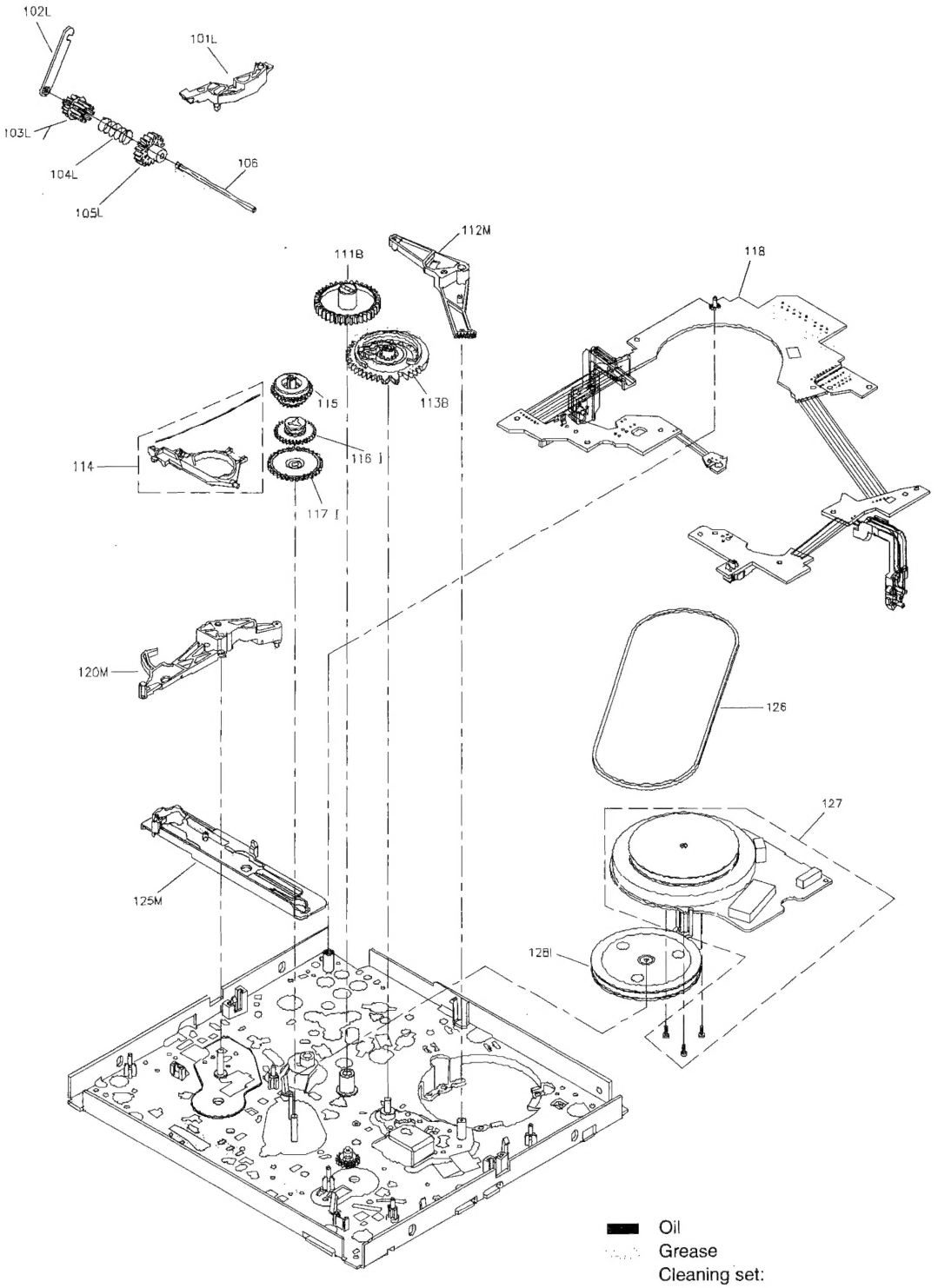
pos. 150

4.3 Exploded view

Top view



Bottom view


102L
101L
103L
104L
106
105L
112M
111B
118
113B
115
114
116 I
117 I
120M
126
127
125M
128I
Oil
Grease
Cleaning set:
Isopropanol
Fibrefree tissue

PARTS LISTS

Exploded View set